

# ***MTD 4000***

**Mettler Traction Decompression**

## **Maintenance Manual**

*Distributed by:*



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# Limited Warranty

The MTD 4000 generating unit is warranted against defects in materials and workmanship for a period of two years from date of purchase. During the applicable warranty period Mettler Electronics Corp. will, at its discretion, either repair or replace the Product without charge for these types of defects.

For service under this warranty, the Product must be returned by the buyer within the applicable warranty period to Mettler Electronics Corp. **Shipping charges to and from Mettler Electronics Corp. under this warranty must be paid by the buyer. The buyer must also include a copy of the sales receipt or other proof of the date of purchase. If the Product is returned without proof of the date of purchase, it will be serviced as an out-of-warranty product at Mettler Electronics Corp.'s prevailing service rates.**

**Alteration, misuse, or neglect of the Product voids this warranty. Except as specifically set forth above, Mettler Electronics Corp. makes no warranties, express or implied, including without limitation any implied warranty of merchantability or fitness for a particular purpose, with respect to the Product. If any implied warranties apply as a matter of law, they are limited in duration to one year.**

**Mettler Electronics Corp. shall not be liable for any indirect, special, consequential or incidental damages resulting from any defect in or use of the Product.**

Any legal action brought by the buyer relating to this warranty must be commenced within one year from the date any claim arises and must be brought only in the state or federal courts located in Orange County, California.

Some states do not allow limitations on how long an implied warranty lasts, or the exclusion or limitation of incidental or consequential damages, so the above limitations or exclusions may not apply to the buyer. This warranty gives the buyer specific legal rights, and the buyer may also have other rights which vary from state to state.



# Section 1—Introduction

## 1.1 The Manual

This manual is intended to aid qualified biomedical engineers and technicians in testing, servicing, and repairing MTD 4000's. It contains an equipment description, operating procedures, theory of operation, test procedures, specifications, and troubleshooting tips. For additional assistance you may contact our service department toll free: (800) 854-9305 or outside the continental US 1(714) 533-2221. The email address for the service department is [service@mettlerelectronics.com](mailto:service@mettlerelectronics.com).

This manual is current as of its publication. Mettler Electronics Corp. may, however, make improvements as required. To receive manual changes, send your name and address to:

Mettler Electronics Corp.  
Service Manual Changes  
1333 S. Claudina Street  
Anaheim, CA 92805.

## 1.2 The MTD 4000

The MTD 4000 is a Traction Decompression system distributed by Mettler Electronics Corp. The microprocessor controlled MTD 4000 provides cervical or lumbar traction by exerting therapeutic pulling forces on the patient's body with enhanced reliability and ease of use.

The MTD 4000 system is an easy to use device that offers static and intermittent traction with user definable hold, rest, and treatment times. It gently pulls the cervical spine or lumbar spine in opposite directions to draw the soft tissue around the cervical or lumbar joints and separate the distance between bone sections of the vertebra.

## 1.3 Precautions

1. The MTD 4000 operates with high voltages. Servicing should be performed by qualified electronics technicians or the unit should be returned to the factory for service.
2. The internal circuit boards are not designed to be serviced at the component level because of the extensive use of surface mount circuitry. Any attempt at replacing a surface mount component may result in damage to the board. Replace entire circuit board assemblies only!
3. For maximum safety, plug the MTD 4000 into a grounded wall outlet of proper voltage only or use the optional battery. Follow general safety practices for medical electronic equipment.
4. The MTD 4000 requires AC 110V~120V, 50/60Hz primary power (other voltages available). DISCONNECT THE LINE SUPPLY CORD PRIOR TO DISASSEMBLY OF THE UNIT FOR SERVICE. Line supply voltage is present on primary components exposed by removing the back cover.
5. Use calibrated test equipment in good working order.
6. USE OF CONTROLS OR ADJUSTMENTS, OR PERFORMANCE OF PROCEDURES OTHER THAN THOSE SPECIFIED IN THIS MANUAL AND IN THE MTD 4000 INSTRUCTION MANUAL, MAY RESULT IN HAZARDOUS EXPOSURE TO ELECTRICITY.
7. Do not operate the MTD 4000 in close proximity to operating shortwave or microwave diathermies.
8. Replace line fuses with specified type and rating only, to avoid risk of fire or other damage.
9. Do not operate the controls with pointed objects such as pencils, pens, or tools.
10. Make sure all connectors are tight with all pins making good contact when reassembling the unit after service.
11. As a prescription device, the MTD 4000 may be sold only to, or on the order of, a physician, physical therapist, or other practitioner licensed by the state in which he/she practices.

## 1.4 Labels

Each medical device must be uniquely identified for traceability and device history. This is accomplished with serial numbered labels unique to each device.

Product labels provide performance data, and must remain on the device at all times. Preserve label integrity during repair and servicing when actions such as removing access covers could cause label damage.

Please include model and serial numbers when requesting service assistance from the factory, including serial number of printed circuit board assembly, as applicable.

## 1.5 Calibration and Maintenance Schedule

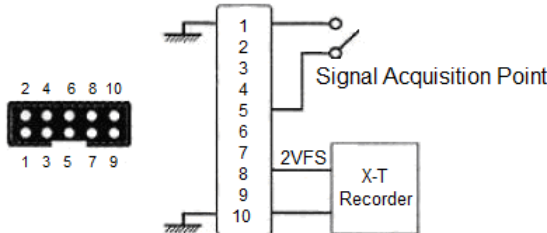
### ❖ Device Calibration

Period/Timing: To ensure the output force is correct, MTD 4000 traction device needs to be regularly calibrated every 1 year or every time while the maintenance is done. Please refer to the **Section 7 for device calibration**.

### ❖ Cable Replacement

Period/Timing: The traction cable shall be replaced every 2 years for maintenance. Please refer to the **Section 8 for cable replacement**. The **MTD 4000 must be recalibrated after cable replacement**.

## 1.6 Tools and Fixtures for Maintenance

| General Tools     |                           |   |  |
|-------------------|---------------------------|---|--|
| Item              | Name                      | Specification                           | Description  |
| 1                 | Open-end Torque Wrench    | 13 mm                                   | Torque Range :6-60 Kg  |
| 2                 | Torque Hex Wrench         | No. 1.5, 2, 2.5, 3, 4, 5                | Torque Range :6-60 Kg  |
| 3                 | Torque Socket Wrench      | No. 10                                  | Torque Range :6-60 Kg  |
| 4                 | Philip Torque Screwdriver | Standard Type                           | Torque Range :6-60 Kg  |
| 5                 | Pliers                    | Standard and 90° degree                 | Holding, cutting and bending the parts   |
| 6                 | Tweezers                  | Normal Tweezers                         | Picking up and manipulating the small parts  |
| 7                 | Thread locker Gel         | Threaded fastener between 1/4" and 3/4" | Removable medium strength thread locker (i.e. Loctite 243)   |
| 8                 | Cable Tie                 | 100mm x 2.5 mm                          | Ties are used to bundle wires, cables and tubing together.   |
| 9                 | Tapping Tool              | M4 or other size                        | Cleaning the remaining thread locker gel   |
| Calibration Tools |                           |   |  |
| Item              | Name                      | Model                                   | Description  |
| 1                 | Electronics Force Meter   | ALGOL/HF-100                            | <p>ALGOL/HF-100</p> <ul style="list-style-type: none"> <li>● Load bearing shall be over 100 kg</li> <li>● Provided with RS-232 transmission interface</li> </ul>  <p>RS-232 Transmission Interface</p> |



|   |                                   |           |  |
|---|-----------------------------------|-----------|--|
| 2 | Force Meter<br>Transmission Cable | PD3-0149  | The transmission line between force meter and traction is provided and designed by ZMI, please contact manufacturer if needed.   |
| 3 | Traction Fixture                  | OTH-05-03 | <ul style="list-style-type: none"> <li>● The fixture shall be able to bear over 100 kg load to ensure stability during calibration.</li> <li>● Mettler has its own designed fixture, please contact manufacturer if needed.</li> </ul> |



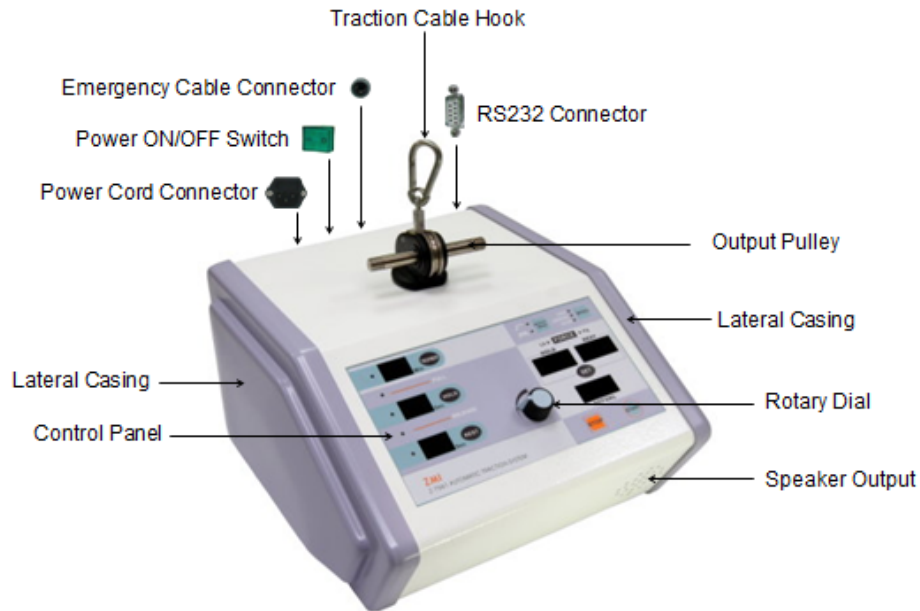
## Section 2—Specifications

|                                |  |
|--------------------------------|--|
| Power Supply                   | AC 110V~120V, 50/60Hz<br>AC 220V~240V, 50/60Hz   |
| Power Consumption              | 100 W (Max.)   |
| Fuse                           | 2.0 A/ 250 V× 2 Slow Blow<br>1.0 A/ 250 V× 2 Slow Blow   |
| Maximum Output Force           | 90 Kg / 198 lb   |
| Output Force Tolerance         | 2-20 kg ±0.75 kg (4-44 lb ± 2 lb)<br>21-50 kg ±1.5 kg (45-110 lb ± 3 lb)<br>51-90 kg ±2.0 kg (111-198 lb ± 4 lb) |
| Traction Speed                 | FAST - NORMAL - SLOW   |
| Hold / Rest Period             | 1 ~ 99 Seconds   |
| Treatment Time                 | 1 ~ 99 minutes   |
| Treatment Mode                 | Continuous / Intermittent  |
| Security System                | Error Code E1 - EE   |
| Display                        | Yellow / Green Digital LED Display   |
| Patient Safety Switch          | 2 Pin connector, push button normally close  |
| Electromagnetic Compatibility  | IEC 60601-1-2  |
| Medical Device Classification  | Class IIa as per MDD 93/42/EEC, Annex IX   |
| CE Marking                     | CE 0434  |
| Operation Temperature/Humidity | 0~40°C / 90%RH under   |
| Storage Temperature/Humidity   | -20~60°C / 90%RH under   |
| Dimension                      | L 14.2" × W 12.2" × T 9"   |
| Net Weight                     | 32 pounds  |

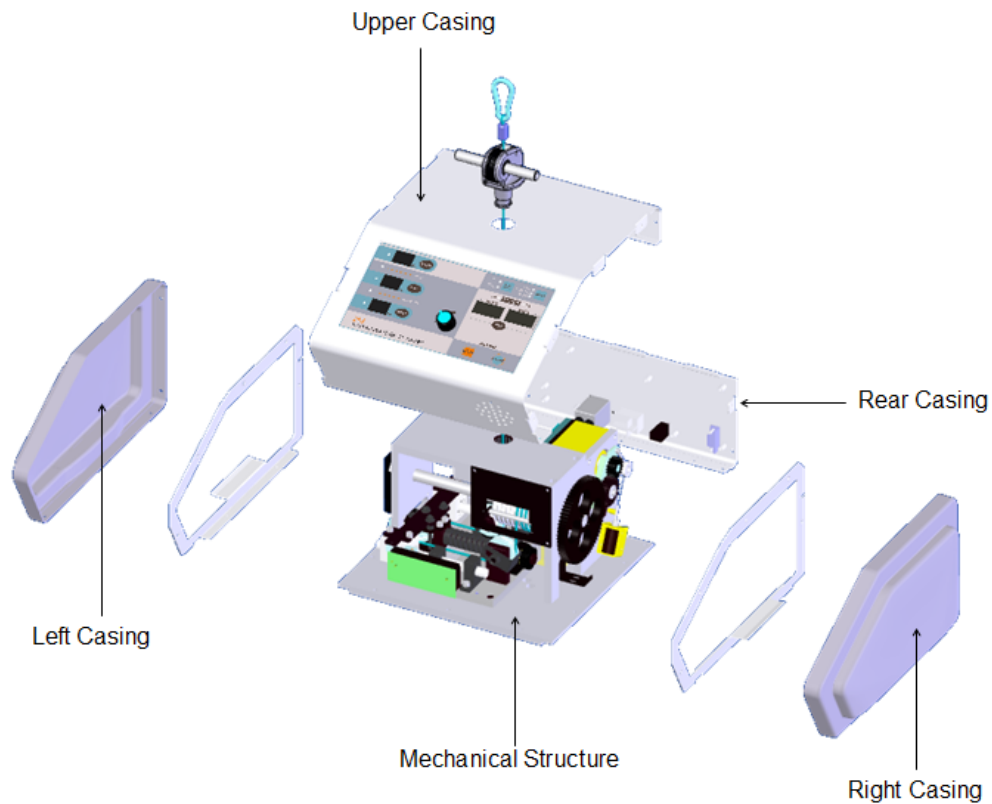


# Section 3—Configuration and System Chart

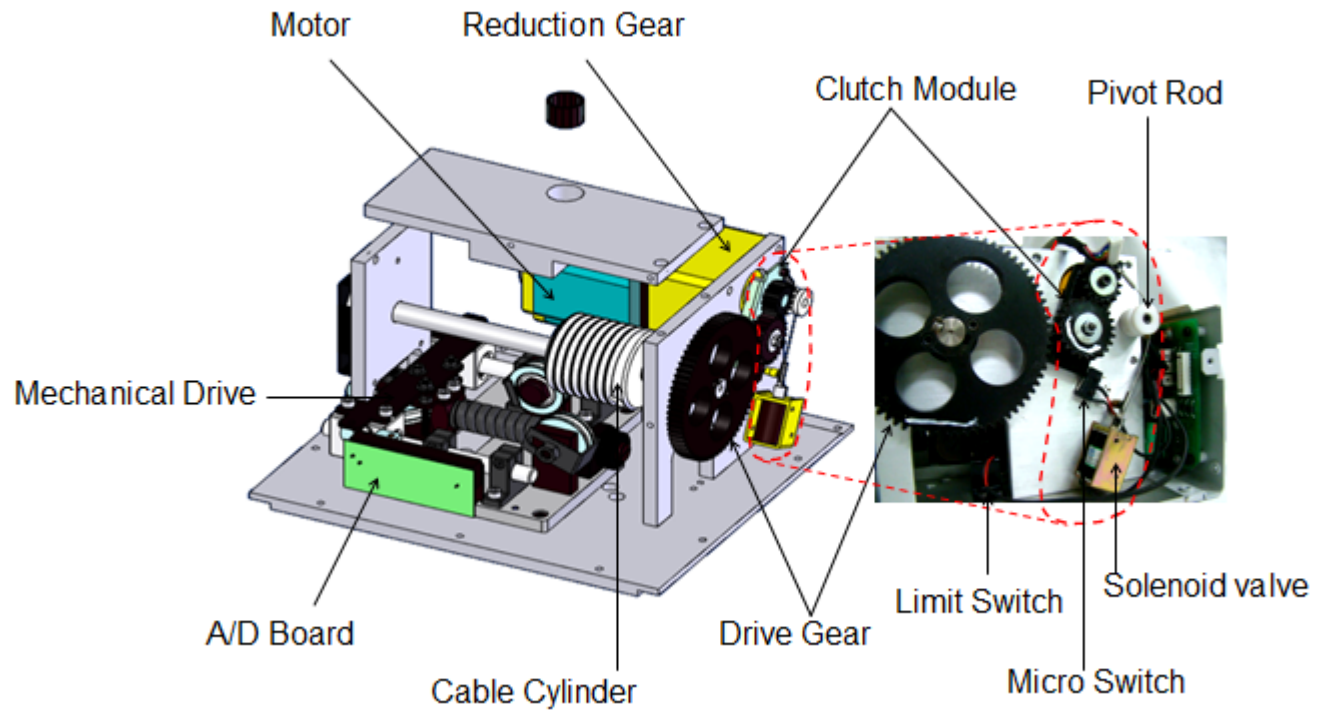
## 3.1 MTD 4000 Configuration



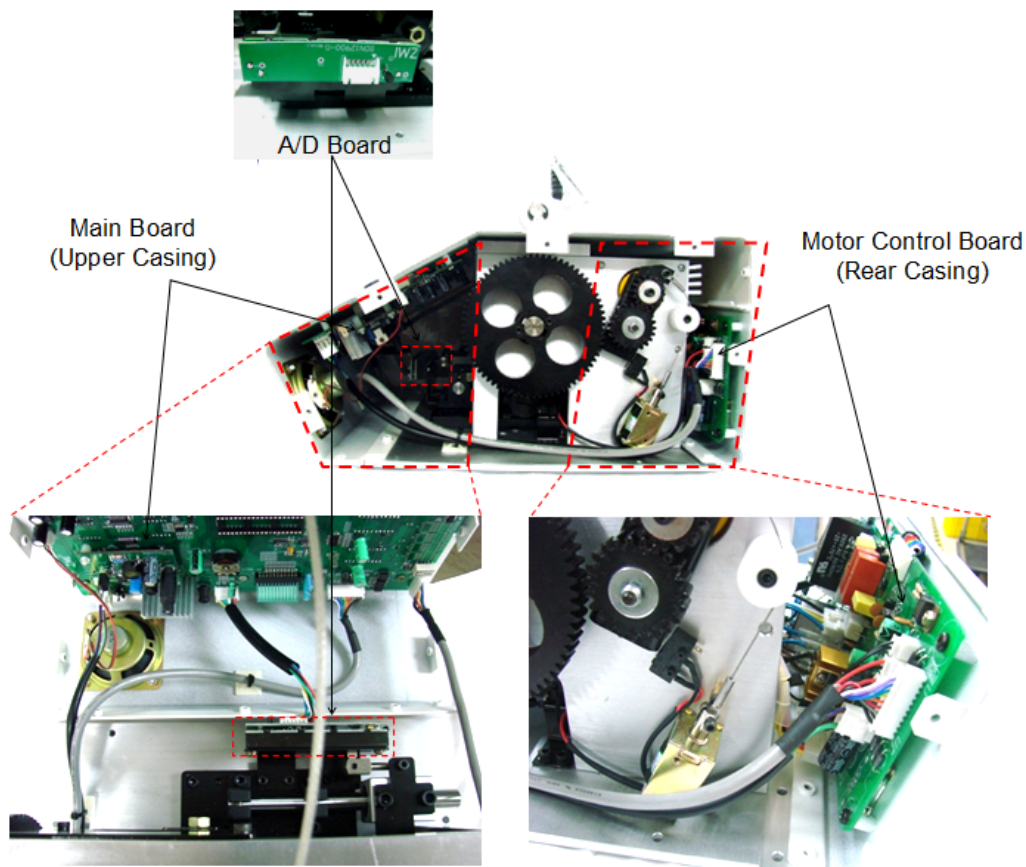
## 3.2 MTD 4000 Disassembly Diagram



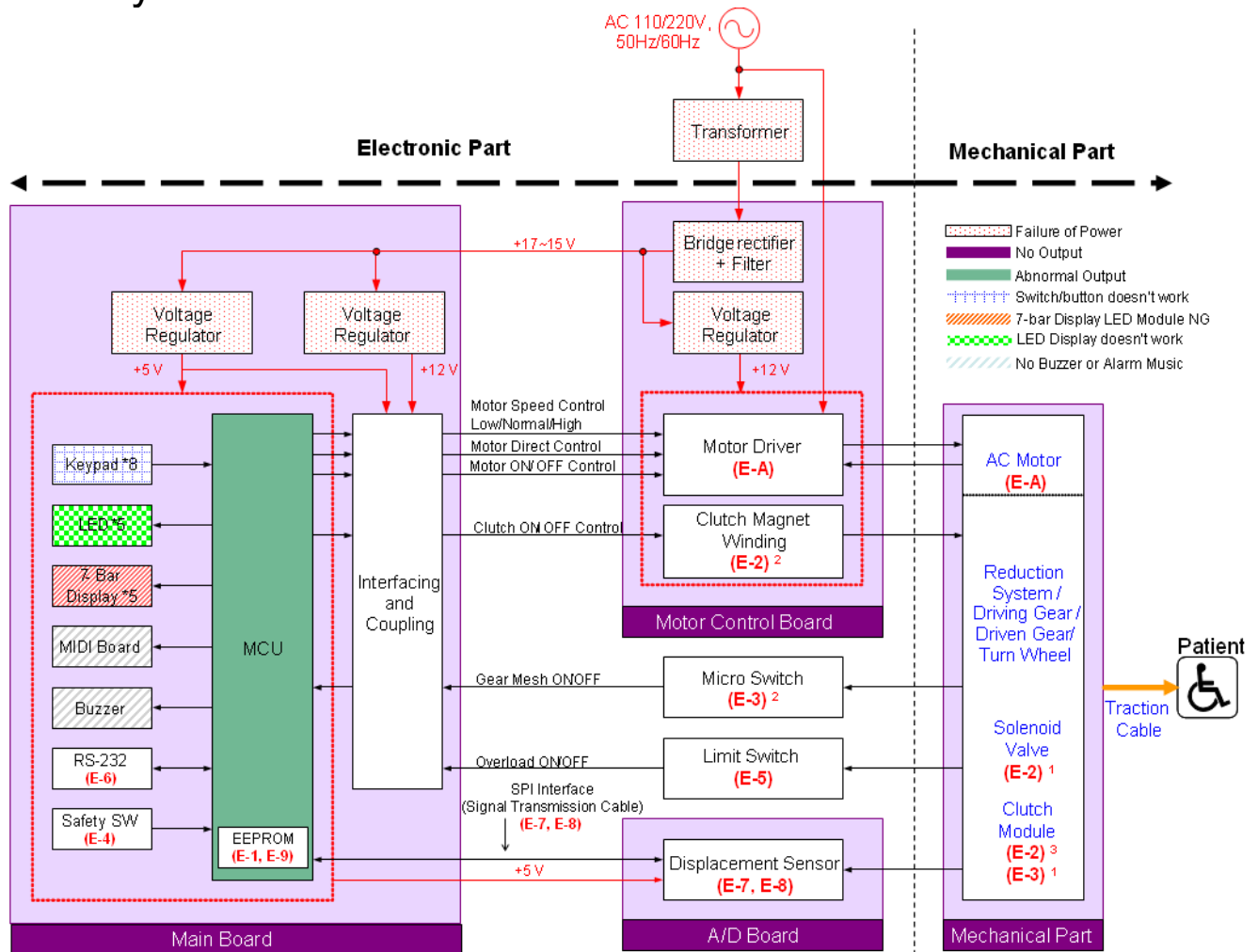
### 3.3 Mechanical Structure



### 3.4 Printed Circuit Board Placements



### 3.5 System Chart



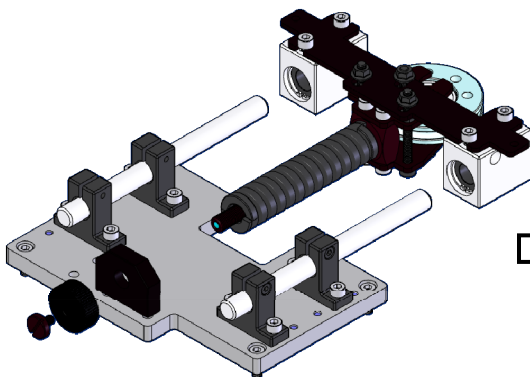
This system chart provides a comprehensive concept of system control logic and fast troubleshooting. The Z7561 traction system consists of two main parts: electronics and mechanical. The electronics part includes main board, motor control system board and A/D board. The main board controls all peripheral I/O as a control center of traction system. The motor control board receives the control signals from main board and simultaneously supplies the driving power to the AC motor. The A/D board is used to detect the displacement of gearing and gives feedbacks to the main board.

The mechanical part not only receives the driving power from motor control board and brings a displacement change to A/D board but also provides special components for error detections.

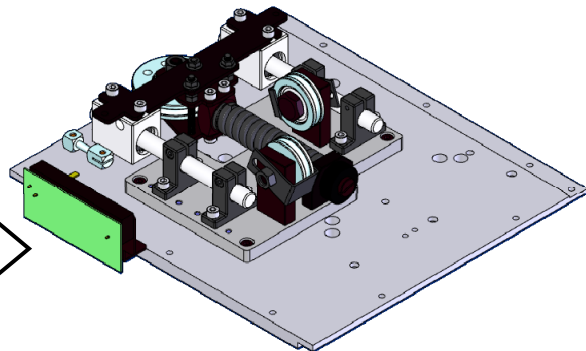
In addition, this system chart also gives an index of fast troubleshooting. Technicians and mechanics can fast and easily search for the corresponding problems and solutions.

## 3.6 Assembly Parts I

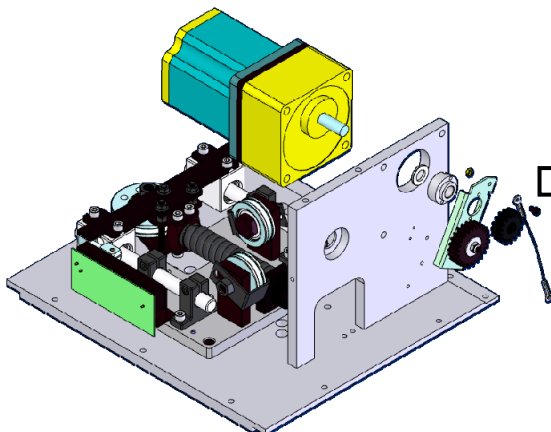
Step1: Assemble the mechanical drive.



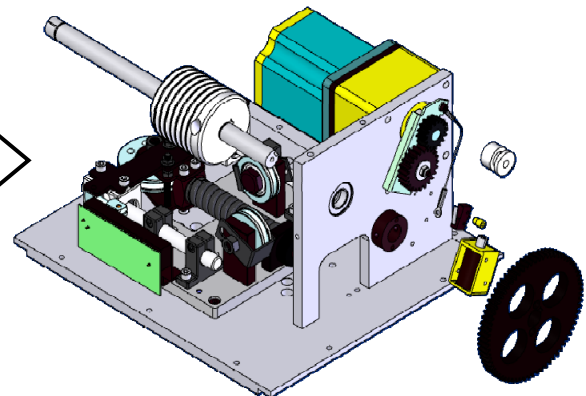
Step2: Place the mechanical drive, transformer, and limit switch on the base plate, and install the A/D Board on the side of mechanical drive.



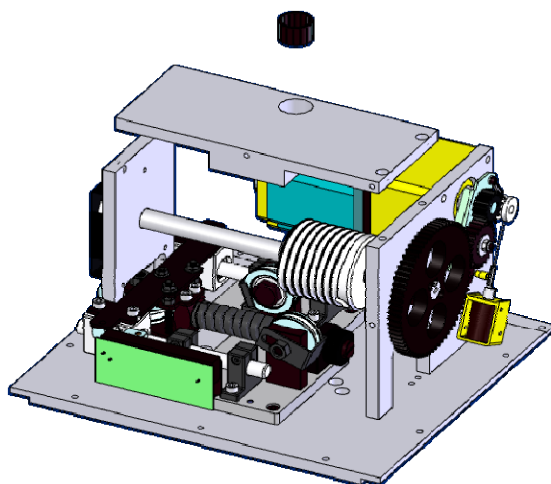
Step3: Fix the lateral plate and partition plate, and then install the motor with reduction gear, and mount the clutch module on the lateral plate.



Step4: Install the Traction Rope Axis to the lateral plate. Mount the Micro Switch, Pivot Rod, Solenoid Valve, and Drive Gear on the lateral plate, and then connect all with clutch module to be a mesh system.



Step5: Install and fix the other lateral plate and upper plate with ball bearing module (black circle).



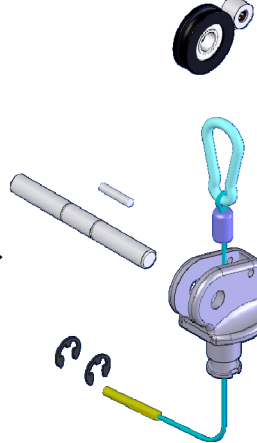


## 3.7 Assembly Parts II

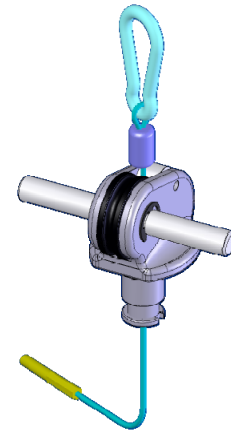
Step1: Assemble the Cable Hook and Cable Sheave.



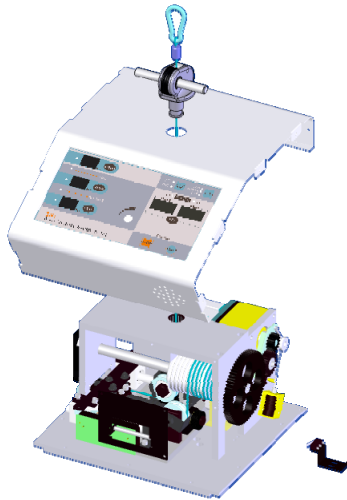
Step2: Assemble the Assistant Sheave and its axis.



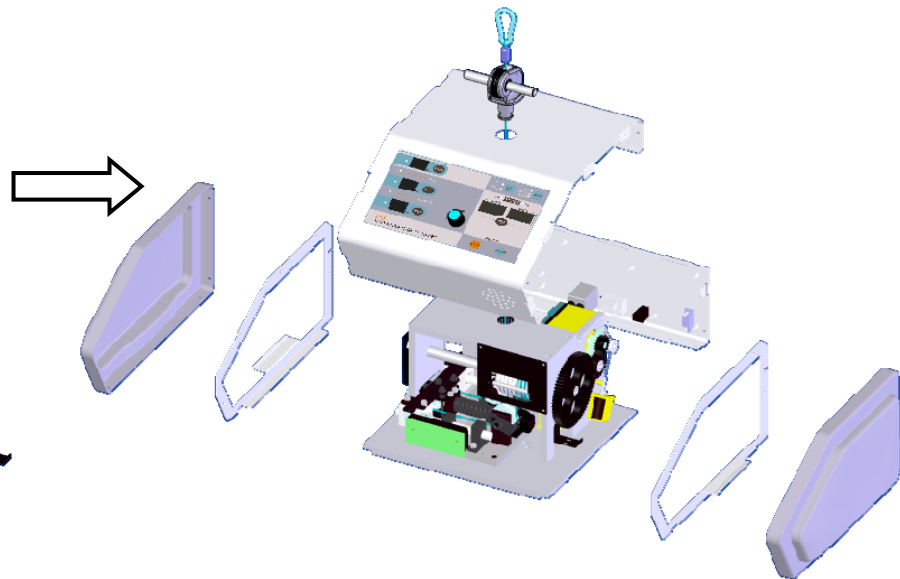
Step3: Fixed by two C-shape retaining rings



Step4: Pass the Cable through the Upper Casing (Main Board placed) and Mechanical Drive to the inner cable cylinder.



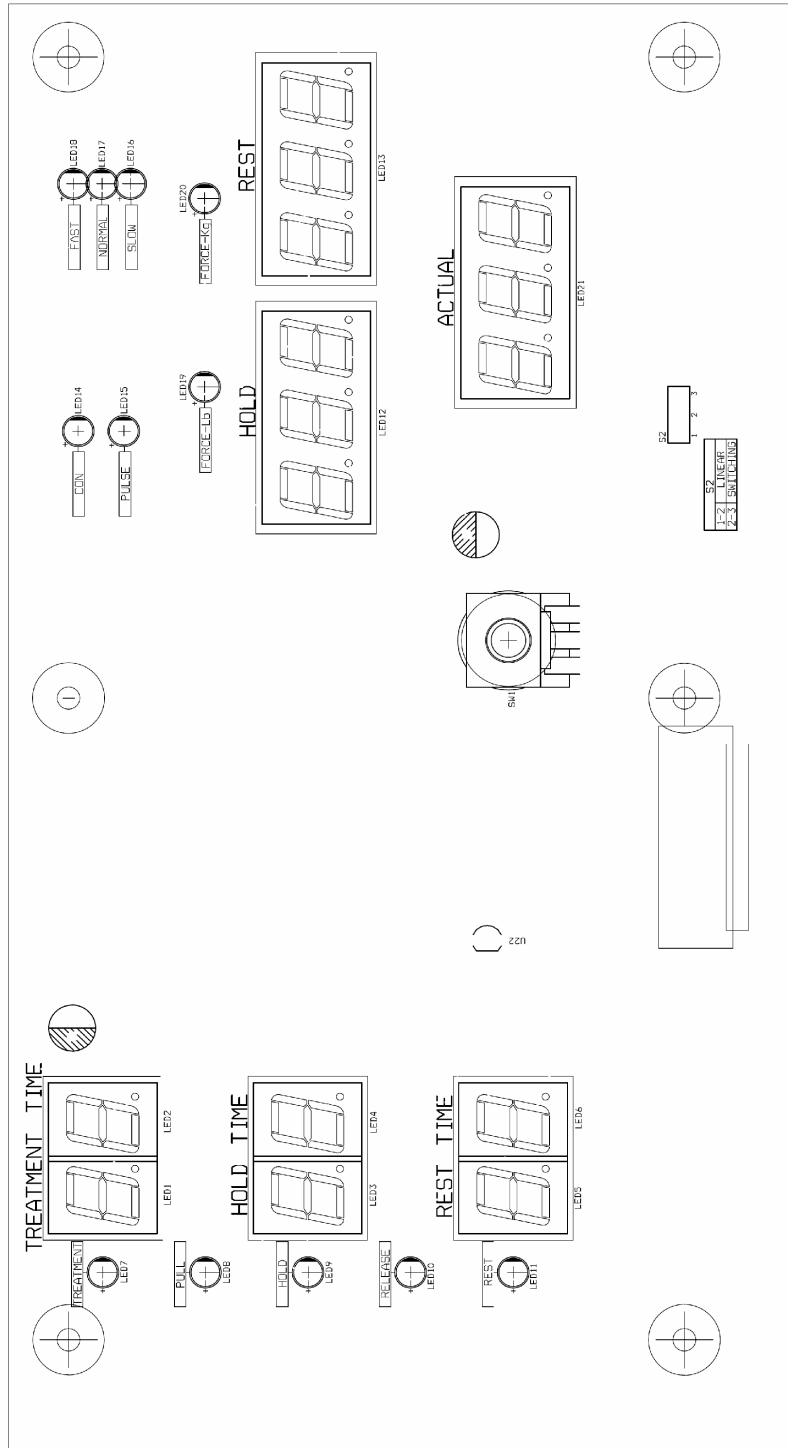
Step5: Connect all terminals and connectors. Assemble the Rear Casing (Motor Control Board placed) and Bilateral Casings.





# Section 4—Drawing and Diagrams

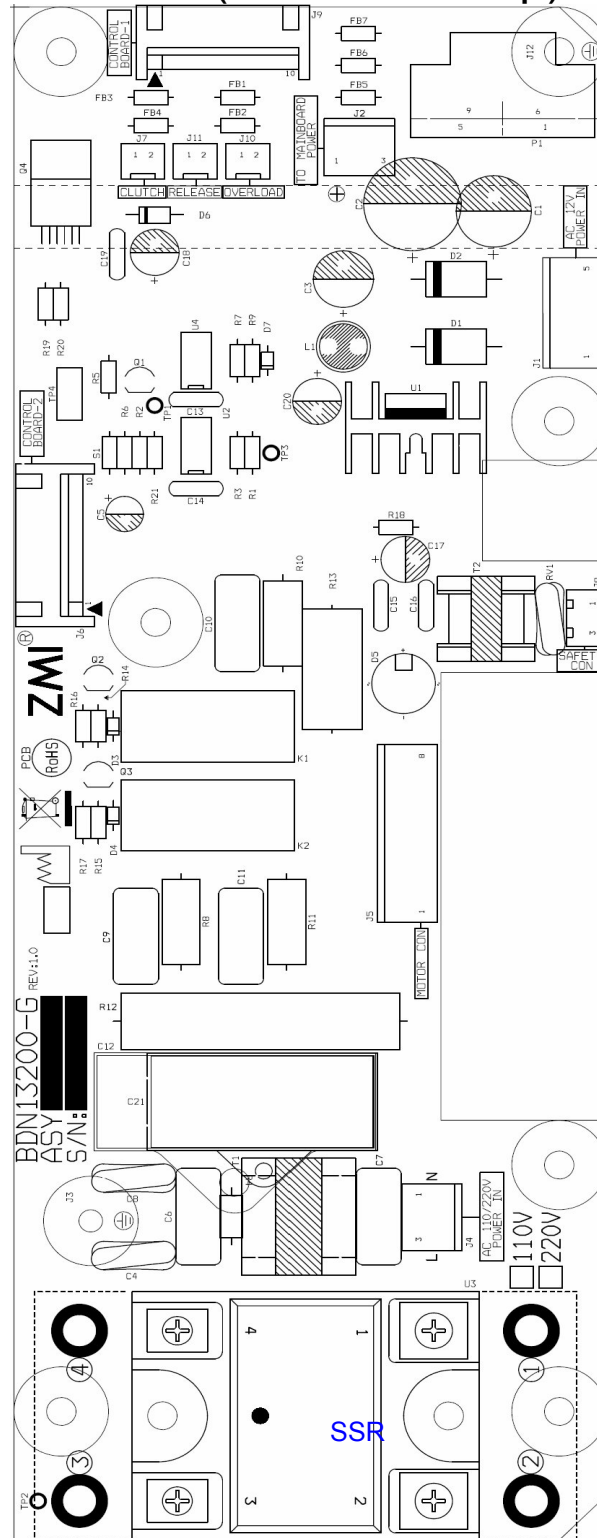
## 4.1 Main Board (Silkscreen Top)



| Part No. | Name of Material    | Troubleshooting   |
|----------|---------------------|---|
| ASY2910X | MTD 4000 Main Board | E-1, E-6, E-7, E-8, E-9, E-A, 7-bar display LED module NG, Switch/button, or LED display doesn't work, No output or abnormal output, No Buzzer or Alarm Music |

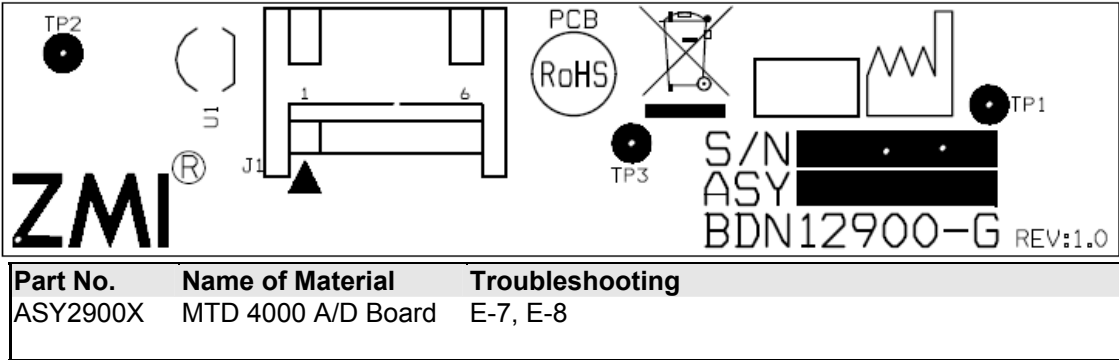


## 4.3 Motor Control Board (Silkscreen Top)

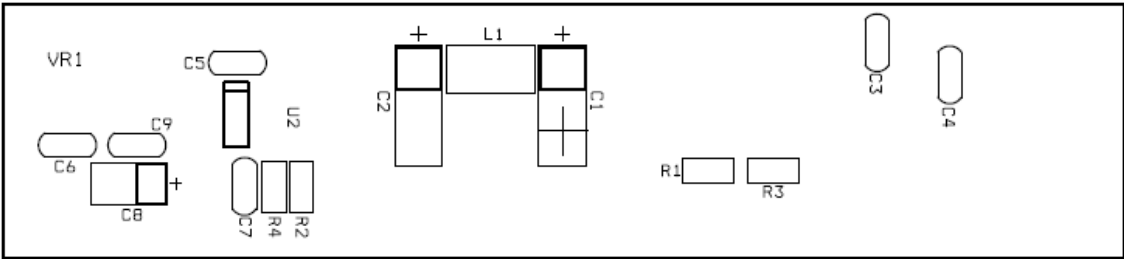


| Part No. | Name of Material  | Troubleshooting |
|----------|---|-----------------|
| ASY3324X | 4000CE Motor Control Board E-2, E-3, E4, E-5, E6, E-8, E-A, Failure of power, |                 |
| ASY3323X | ME4000 Motor Control Board No output  |                 |

4.4 A/D Board (Silkscreen Top)



4.5 A/D Board (Silkscreen Bottom)



# Section 5—Troubleshooting Guide

1. **PRE-TASKS OF REPAIR** - the technicians or engineers must receive the training for device installation and casing detachment. Except the external parts, all internal parts need to do these two procedures. Please refer to the first category Casing of service DVD.
2. **ERROR EXAMINATION** - this service manual provides a table for quick troubleshooting and a detailed procedure for complete troubleshooting. The technicians or engineers are able to examine the causes of error and try to fix it.
3. **SEVICE DVD** - the technicians or engineers shall follow the procedures of replacement in the service DVD and fix the parts according to the material list in the section 3.

**\*The table of content of DVD**

|                                     |                                 |
|-------------------------------------|---------------------------------|
| <b>Casing</b>                       |                                 |
| (1) Device Installation             | (2) Case Detachment             |
| <b>PCBs</b>                         |                                 |
| (1) Main Board                      | (2) Motor Control Board         |
| (3) A/D Board                       |                                 |
| <b>Parts</b>                        |                                 |
| (1) Clutch Module                   | (2) Solenoid Valve              |
| (3) Micro Switch                    | (4) Limit Switch                |
| (5) Drive Gear                      | (6) Motor                       |
| (7) Fuse                            | (8) Speaker                     |
| (9) Transformer                     |                                 |
| <b>Cables</b>                       |                                 |
| (1) A/D Cable                       | (2) Signal Cables               |
| <b>Calibration</b>                  |                                 |
| (1) Automatic Calibration           |                                 |
| <b>Traction Cable Replacement</b>   |                                 |
| (1) Disassembling the Output Pulley | (2) Removing the Traction Cable |
| (3) Installing the Traction Cable   |                                 |

4. **AUTO-CALIBRATION** - once the part replacements are finished, the technicians or engineers can do the initial pretest to check the status of device. And then please run the auto-calibration and observe the results until the calibration is finished.
5. **QC AND RECORD** – Each repair has to proceed the easy QC and check all functions. The QC report must be filed for the purpose of regular device traceability. If necessary, please send back the copy to the manufacturer for further analysis. Please refer to the Appendix.

## 5.1 Simple Troubleshooting

| Code | Problem   | Possible Cause   | Solution  |
|------|---|--|---|
| E-1  | EEPROM calibration data is wrong                              | Did not implement calibration or the saved data was wrong; or<br>Did not test limit switch function, or the limit strength data was wrong. | Calibrate the unit.   |
| E-2  | Solenoid valve is damaged                                     | The valve is broken or improperly connected.   | Check and make sure the harness cable is properly connected.<br>Replace Solenoid valve if necessary.  |
| E-3  | Micro switch of clutch is damaged                             | Micro switch has no signal or is damaged   | Replace the micro switch if necessary.  |
| E-4  | Emergency switch (the patient safety switch) has been pressed | Emergency switch is pressed, removed, or improperly connected.   | Check and make sure the emergency stop switch is properly connected. Press STOP to remove error code. |
|      |   | Emergency stop switch damaged.   | Replace the patient safety switch.  |
|      |   | Emergency control circuit NG.  | Replace motor control board.  |
| E-5  | Pull strength reached limit                                   | The pull strength reached safety limit.  | 1. Reset the device.<br>2. Calibrate the unit.  |
| E-6  | Force Meter communication NG                                  | Force meter is not properly connected or wrongly set up  | 1. Press STOP to remove error code.<br>2. Check and make sure load cell is properly connected.        |
| E-7  | LTC1400 ADC no signal or NG                                   | Signal transmission cable is not properly connected.   | Check and make sure the signal transmission cable is properly connected.                              |
|      |   | LTC1400 damaged.   | Replace A/D board if necessary.   |
| E-8  | Sudden and abnormal pull strength                             | A sudden strength in exceed 3 kg and maintained for over 1 second.   | Check cable connection and press the stop button to remove error code.                                |
| E-9  | EEPROM non-calibration data is wrong                          | No-calibration data has been improperly saved.   | Press the STOP button to remove error code.   |

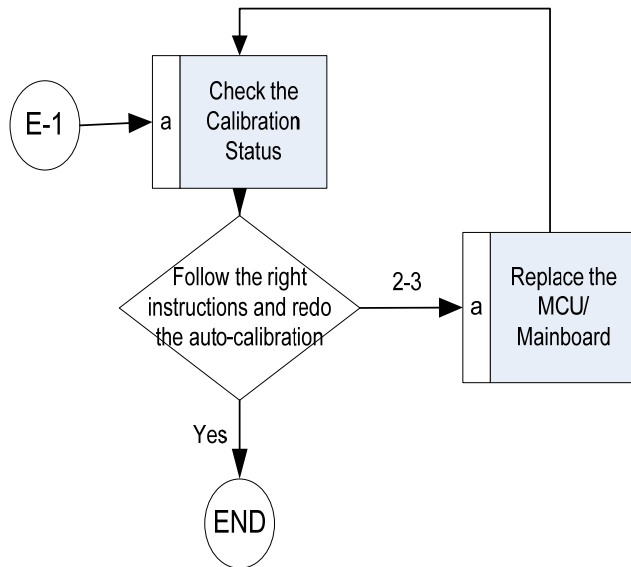


|     |                          |   |   |
|-----|--------------------------|---|---|
| E-A | Detect motor performance | <p>Pulling or releasing takes longer than the default time, 50 seconds. This will happen if the patient is incorrectly strapped where traction forces cannot reach the setting value.</p> <ul style="list-style-type: none"> <li>- Strap too loose.</li> <li>- Patient's body is not positioned appropriately on the table.</li> <li>- Motor non-conformance</li> </ul> | <ul style="list-style-type: none"> <li>- Turn off</li> <li>- Check table mechanism</li> <li>- Re-strap patient</li> <li>- Make sure the patient's body is appropriately positioned</li> <li>- Turn on and try again</li> </ul>    |
| E-b | Auto Calibration Error   | Unit detection for force meter in auto-calibration. The unit between system and force meter not set in 'kg'.  | Contact Mettler Electronics for repair service.   |
| E-c | VR failure.              | VR (Variable Resistance) failure.   | Turn off the system. Unhook the traction cable and let it retract completely into the system. Turn on the system and the error will be reset. If the problem still occurs, please contact Mettler Electronics for repair service. |
| E-d | EEPROM failure           | EEPROM data saving failure or EEPROM end of product life.   | Contact Mettler Electronics for repair service.   |
| E-E | Display parameter error  |   | Restart the unit to remove the error. If the problem still occurs, please contact Mettler Electronics for repair service.   |

**\*If the Simple Troubleshooting cannot solve the problem, please refer to the Complete Troubleshooting.**

## 5.2 Complete Troubleshooting

### E-1 EEPROM calibration data is wrong



Step1: Check the Calibration Status first  
(Pull LED: 1<sup>st</sup> Stage, Release LED:

2<sup>nd</sup> Stage)

1<sup>st</sup> Stage – Data Establishment

1-1→ The limit switch didn't locate in the range 93.5~96 kg, please readjust the position.

1-2→ Data sorting is wrong

1-3→ Transmission Error

2<sup>nd</sup> Stage: Data Comparison with

Force Meter

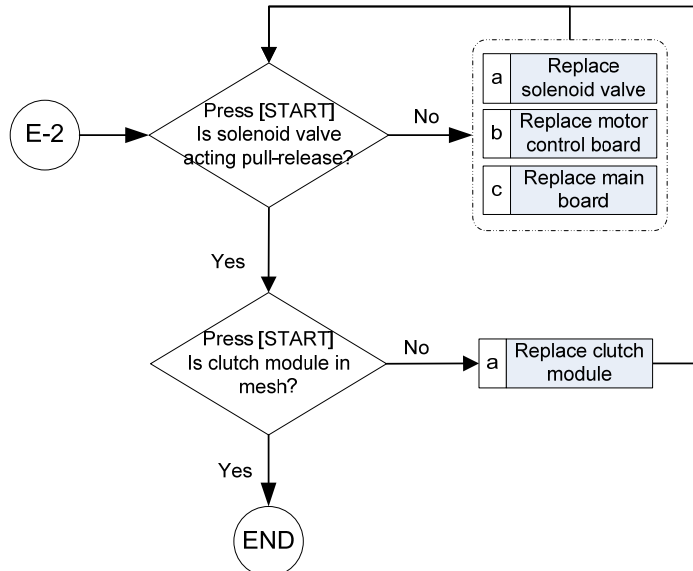
2-1→ Data sorting is wrong

2-2→ Transmission Error

2-3→ MCU Error

Step2: For 1-2, 1-3, 2-1, and 2-2, please redo the auto-calibration. For 2-3, please replace the MCU and burn the firmware in and try again.

### E-2 Solenoid valve is damaged



Step1: Open outer casing, make sure the harness cable is properly connected.

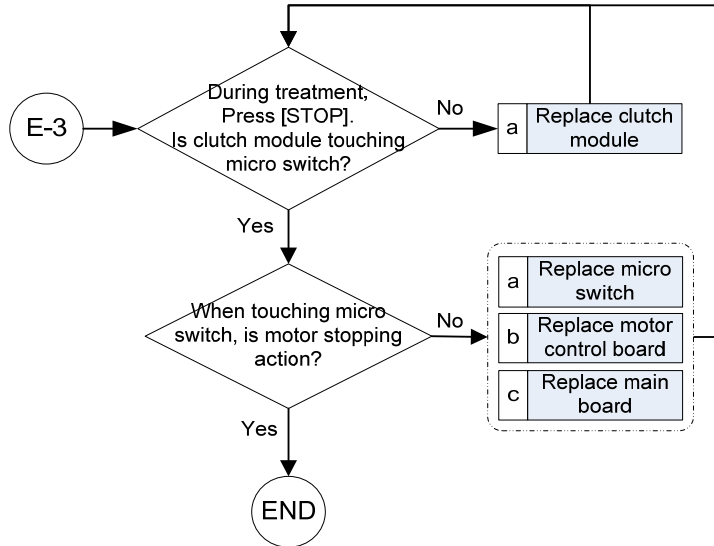
Step2: Press [START]. Check the solenoid valve is acting pull-release. If yes, jump to Step4.

Step3: If not, please replace solenoid valve. If problem still occurs, please replace motor control board. Re-run Step2.

Step4: Press [START]. Check the clutch module is in mesh. If yes, end the process.

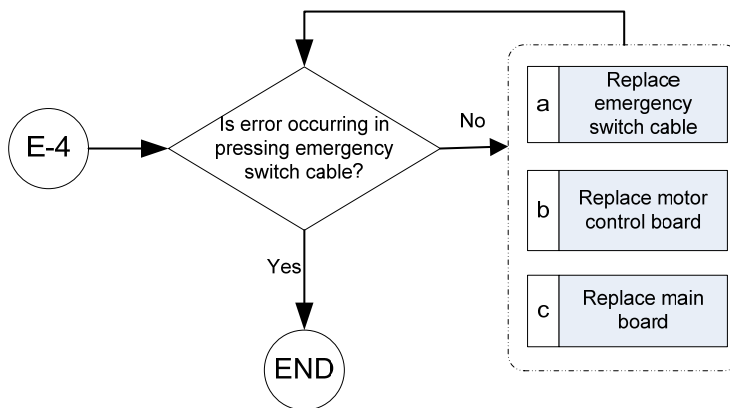
Step5: If not, please replace clutch module. Re-run Step2.

### E-3 Micro switch of clutch is damaged



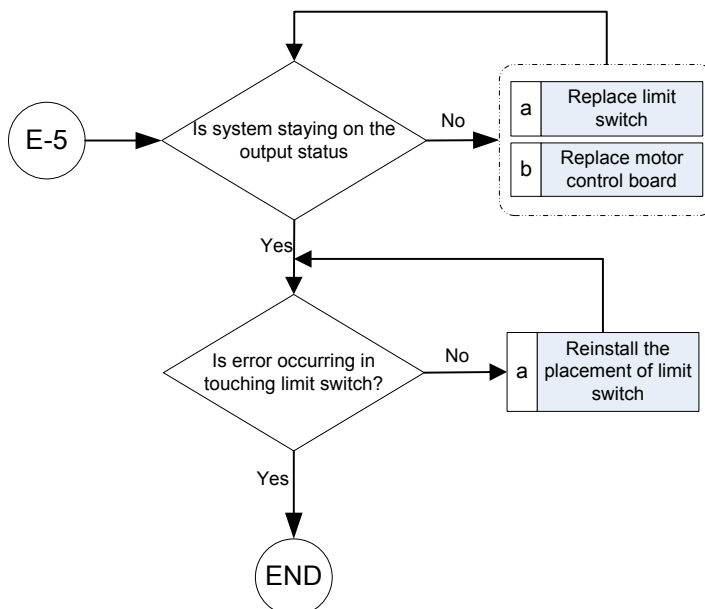
- Step1: Open outer casing.  
 Step2: Press [STOP]. Check the clutch module is touching micro switch. If yes, jump to Step4.  
 Step3: If not, please replace clutch module. Re-run Step2.  
 Step4: Check motor is stopping action while clutch module touching micro switch. If yes, end the process.  
 Step5: If not, please replace micro switch. Run step2. If the problem still occurs, please replace motor control board.

### E-4 Emergency switch (patient safety switch) has been pressed

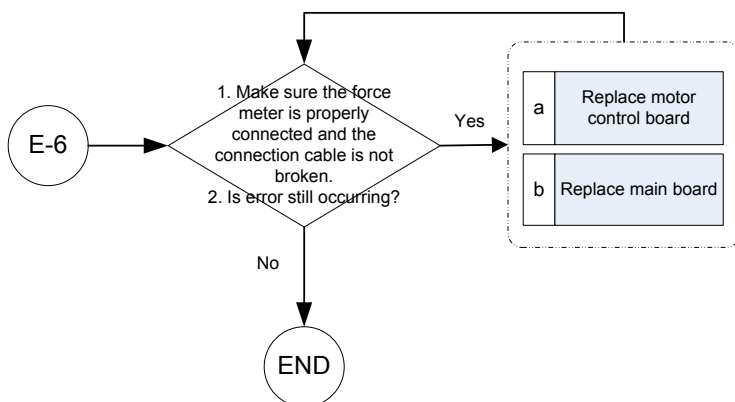


- Step1: Make sure the emergency stop switch is properly connected. Check the error is occurring when it is pressed. If yes, end the process.  
 Step2: If not, please replace emergency switch cable. Check again. If the problem still occurs, please replace motor control board.

### E-5 Pull strength reached limit

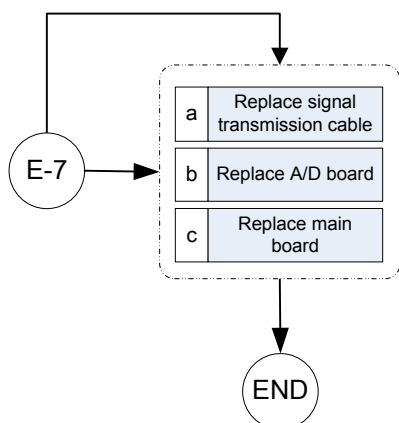


- Step1: Restart the system. If the problem is still occurring, run Step2.  
 Step2: Check system is staying on the output status. If yes, run Step4.  
 Step3: If not, please replace limit switch. Check again. If the problem is still occurring, please replace motor control board.  
 Step4: Check the error is occurring in touching limit switch. If yes, end the process.  
 Step5: If not, please reinstall the placement of limit switch. Run Step4.

**E-6 Force Meter communication NG**

Step1: Make sure the force meter is properly connected and its transmission cable is not broken. And then check the error is still occurring. If not, end the process.

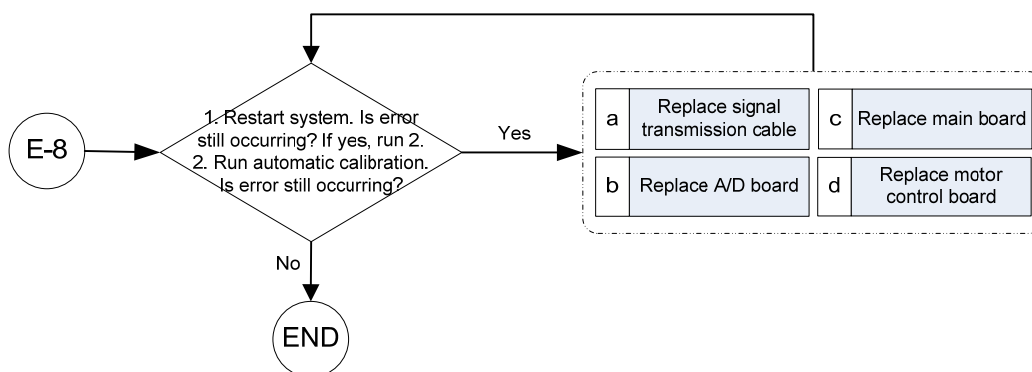
Step2: If yes, please replace the motor control board, run Step1 again. If error is still occurring. Please replace main board.

**E-7 LTC1400 A/D Converter no signal or NG**

Step1: Check and make sure the signal transmission cable is properly connected. If the problem is still occurring, run Step2.

Step2: Replace A/D Board, check again. If the problem is still occurring, run Step3.

Step3: Replace main board, end the process.

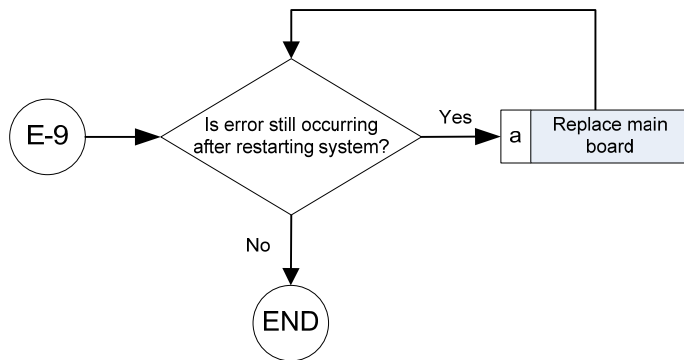
**E-8 Sudden and abnormal pull strength**

Step1: Press [STOP] or restart system to remove error code. Check error is still occurring. If yes, run Step2. If not, end the process.

Step2: Run automatic calibration. Check error is still occurring. If not, end the process.

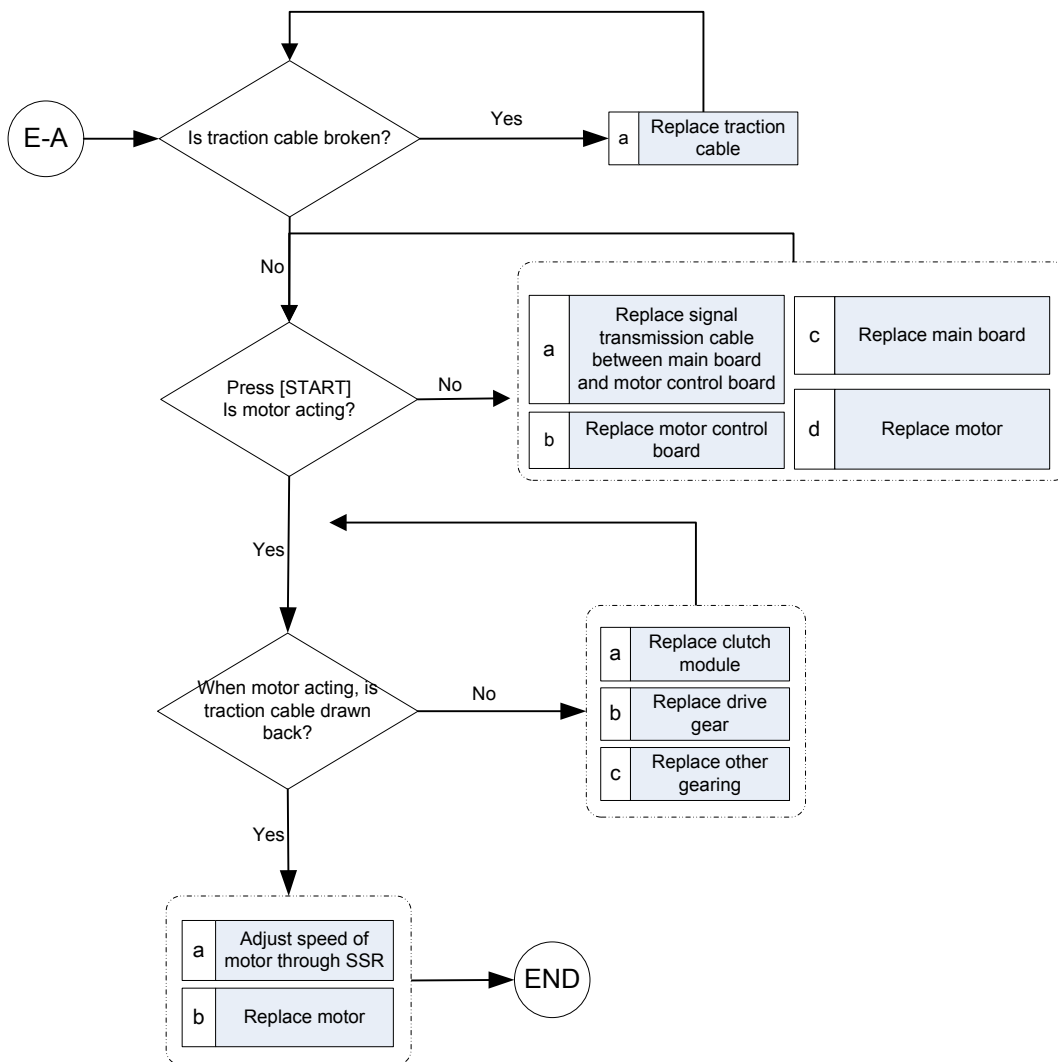
Step3: If yes, try to replace signal transmission cable first and then check again. If problem still exists, try to replace A/D board. If problem still exists, replace main board and motor control board until problem solved.

### E-9 EEPRON non-calibration data is wrong



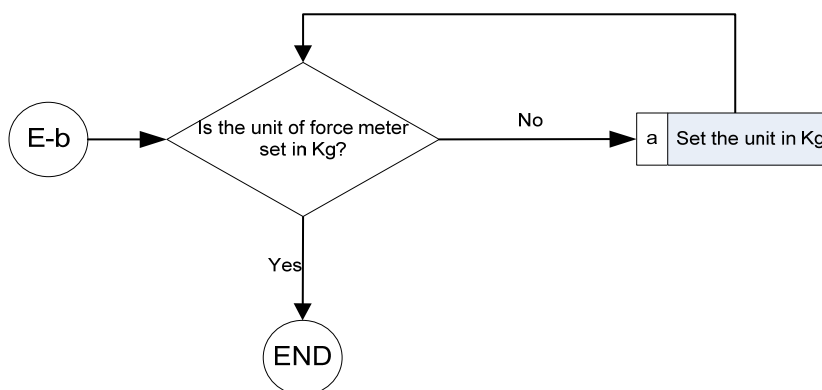
Step1: Press [STOP] or restart the system to remove error code.  
 Step2: Check the error is still occurring. If not, end the process.  
 Step3: If yes, please replace main board and then run Step2 again.

### E-A Motor performance detection



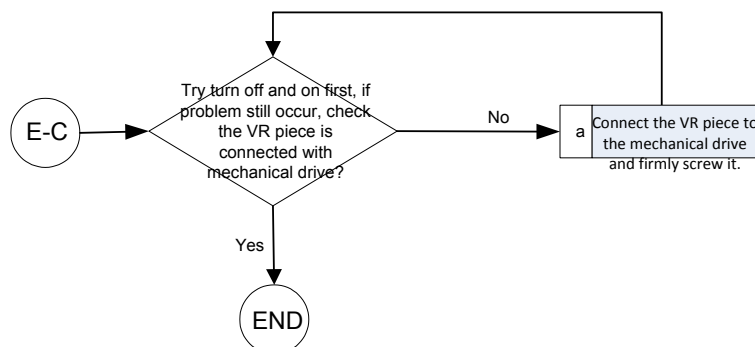
- Step1: Restart the system. Check error is still occurring. If not, end the process.  
 Step2: If yes, please check the traction cable is broken. If not, run Step4.  
 Step3: If it is broken, please replace traction cable and then run Step2 again.  
 Step4: Press [START], check motor is acting. If yes, run Step6.  
 Step5: If not, make sure the signal transmission cable between main board and motor control board is not broken and well-connected. If problem still exists, replace the motor control board and check again. If problem still exists, replace main board and check again. If problem still exists, replace motor and check again.  
 Step6: Check the traction cable is drawn back while motor acting. If yes, please adjust speed of motor through SSR. If the speed of motor is still too slow due to motor aging, please replace motor and end the process.  
 Step7: If not, please check the clutch module and Drive Gear. Replace them if necessary and then run Step6 again. Note: If the other gearings are broken, please contact manufacturer directly.

#### E-b Auto Calibration Error



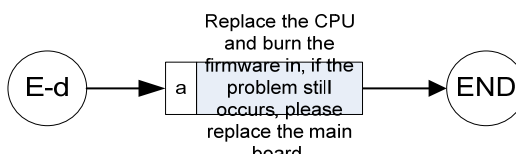
- Step1: Confirm the unit force meter that set in kg. If yes, end the process.  
 Step2: If no, set the unit in Kg and try again.

#### E-C VR failure



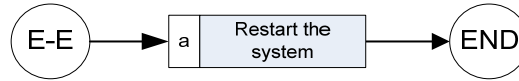
- Step1: Try to turn off and on first, if problem still occurs, check the VR piece is connected with mechanical drive? If yes, end the process.  
 Step2: If no, please connect the VR piece to the mechanical drive and firmly screw it.

#### E-d EEPROM failure



- Step1: Replace the CPU and burn the firmware in, if the problem still occurs, please replace the main board.  
 Step2: Run Auto-calibration

### E-E Display parameter error



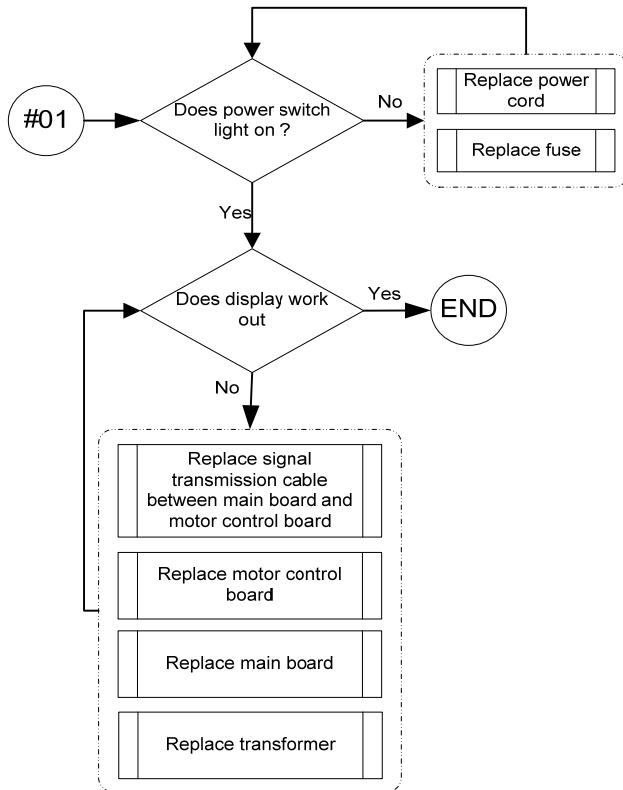
Step1: Restart the system to remove the error code.

## 5.3 Simple Miscellaneous Troubleshooting

| #  | Problem                        | Possible Cause                          | Solution  |
|----|--------------------------------|---|---|
| 01 | Failure to power ON            | Blown fuse                              | Replace fuse.   |
|    |                                | AC power cord NG                        | Replace AC power cord.  |
|    |                                | Transformer NG                          | 1. Check and make sure power cord and transformer are properly connected.<br>2. Replace Transformer if necessary. |
|    |                                | Main board NG                           | Replace main board.   |
| 02 | No output                      | Traction cable NG                       | Replace traction cable.   |
|    |                                | Mechanical damages                      | 1. Check for damages to the mechanical driving parts in motor.<br>2. Replace motor control board if necessary.    |
|    |                                | Circuit NG                              | 1. Replace A/D board first.<br>2. Replace motor control board if the problem is not solved after solution 1.      |
| 03 | Abnormal output                | Wrong parameter of pulling force        | Calibrate the unit. If the problem continues, contact the manufacturer.   |
|    |                                | Error in firmware                       | Replace main board.   |
| 04 | Switch or button does not work | Unit is in operation or releasing force | Switch or button will work normally once unit completes operation or releasing force.                             |
|    |                                | Membrane switch NG                      | 1. Check and make sure if harness cable is properly connected.<br>2. Replace membrane switch if necessary.        |
|    |                                | Encoder NG                              | Replace Main Board if necessary.  |
| 05 | 7-bars display / LED module NG | 7-bars display / LED NG                 | Replace Main Board if necessary.  |
|    |                                | 7-bars display / LED power module NG    | Replace Main Board if necessary.  |
|    |                                | Main control circuit NG                 | Replace Main Board if necessary.  |
| 06 | LED display does not work      | LED module NG                           | Replace Main Board if necessary.  |
| 07 | No buzzer or alarm music       | No buzzer                               | Replace Speaker if necessary.   |
|    |                                | No alarm music                          | Replace Main Board if necessary.  |

## 5.4 Complete Miscellaneous Troubleshooting

### #01 Failure to power on



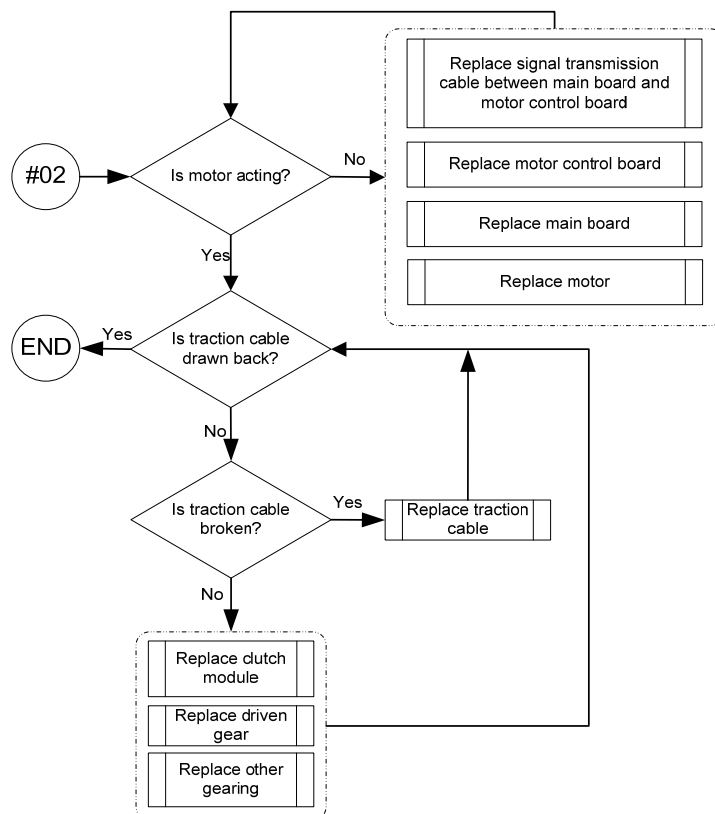
Step1: Make sure the power switch lights on. If yes, run Step3.

Step2: If not, please check **POWER CORD** and **FUSE**, and then replace them if necessary.

Step3: Check the display works out. If yes, end the process.

Step4: If not, please check the signal transmission cable between main board and motor control board, motor control board, main board and transformer and then replace them if necessary. Run Step3 and check again.

### #02 Failure of output



Step1: Check to see if the motor is acting. If yes, run step3.

Step2: if not, check the signal transmission cable between main board and motor control board, motor control board, main board and motor. Replace them if necessary. Run Step1 again.

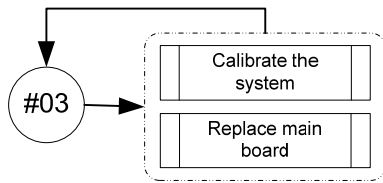
Step3: Check to see if the traction cable is drawn back. If yes, end the process.

Step4: If not, check to see if the traction cable is broken. If yes, replace the traction cable and then run Step3 again. If not, run Step5.

Step5: Check the clutch module, Drive Gear and other gearing. Replace them if necessary.



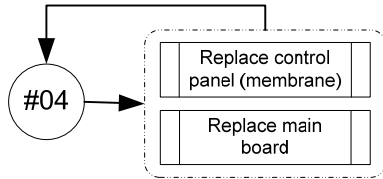
### #03 Abnormal output



Step1: Run automatic calibration and check the output. If the problem continues, run Step2.

Step2: Replace main board and run Step1 again.

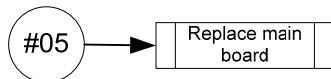
### #04 Failure of switch or button



Step1: Check and make sure if harness cable is properly connected. Replace control panel (membrane) if necessary.

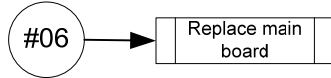
Step2: If problem still exists, please replace main board.

### #05 7-bars display LED module NG



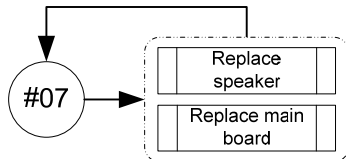
Step1: Replace main board if necessary.

### #06 LED display does not work



Step1: Replace main board if necessary.

### #07 No buzzer or alarm music



Step1: Replace Speaker or main board if necessary.



## Section 6—Replacement Parts

| Part No. | Description   | Qty. |
|----------|---|------|
| QT6-12   | Main Board Assembly   | 1    |
| QT6-13   | A/D Board Assembly  | 1    |
| QT6-14   | Motor Control Board (220V) Assembly   | 1    |
| QT6-15   | Motor Control Board (110V) Assembly   | 1    |
| OA1-13   | Motor (110V), E10753-03, L=150mm, 8 pin/p=3.96 mm, VH (110)                                 | 1    |
| OA1-14   | Motor (220V), E10753-04, L=150mm, 8 pin/p=3.96 mm, VH (220)                                 | 1    |
| DF2-19   | Transformer IN=110/220V, OUT=6V/1A&12V/1A, PA66/EI-66                                       | 1    |
| FA1-15   | Fuse 1A/250V (UTE001) (4000CE)  | 2    |
| FB1-22   | Fuse 2A/250V (UTE002) (ME4000)  | 2    |
| HG1-42   | Membrane Switch   | 1    |
| HH2-26   | Clutch Module   | 1    |
| KP6-05   | Micro Switch  | 1    |
| KP6-06   | Solenoid Valve  | 1    |
| QR5-16   | Signal Transmission Cable 1 (between main board and A/D board)                              | 1    |
| QR5-17   | Signal Transmission Cable 2a (between main board and Motor control board), 3 pin connector  | 1    |
| TD1-14   | Signal Transmission Cable 2b (between main board and Motor control board), 10 pin connector | 1    |
| HH2-27   | Drive Gear  | 1    |
| SB1-09   | Speaker   | 1    |
| ME 40002 | Traction cable with hook  | 1    |
| DA3-31   | Filter 4301.5001 & 4301.1401  | 1    |
| ME 40004 | AC Power Cord 2 pin, 220V   | 1    |
| ME 40003 | AC Power Cord 3 pin, 110V   | 1    |
| ME 40001 | Patient safety switch   | 1    |



# Section 7—Annual Calibration Procedure

## 7.1 Start the Annual Calibration

The annual calibration function is designed to allow technicians to manually calibrate the traction system. The following points should be calibrated:

**kg:** 5, 8, 11, 14, 17, 20, 23, 26, 29, 32, 35, 38, 41, 44, 47, 50, 53, 56, 59, 62, 65, 68, 71, 74, 77, 80, 83, 86, 89

**lbs:** 11.0, 17.6, 24.2, 30.8, 37.4, 44.0, 50.6, 57.2, 63.8, 70.4, 77.0, 83.6, 90.2, 96.8, 103.4, 110, 116, 123, 129, 136, 143, 149, 156, 162, 169, 176, 182, 189, 195

**Note:** The end points - **2kg(4lbs)** and **90kg(198lbs)** - cannot be calibrated manually, for safety reasons.

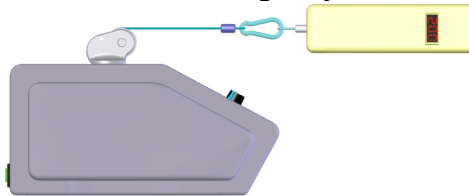
**Note:** All other points in between can be manually calibrated.


1. Turn the force meter **ON** and press the **ZERO** button.

2. Connect the traction cable hook to the fixed force meter, as shown below.


**Note:** The angle of traction cable must be close to a normal therapy situation (nearly  $90^{\circ} \pm 20^{\circ}$ )


**Note:** The force meter should be calibrated regularly.




3.  On the MTD4000 traction system, press and hold the **SET** button and turn on the system. [ON switch is in the back by the power cord]. Continue to hold the **SET** button for 3 sec until the screen displays [F-0].


4. Set the Units on the traction system to the same as the force meter: both in Kilograms or both in Pounds. To change the Units, press the **START** button and use the **SET** button to switch between kg and lbs. Press **STOP** to save Units selection.






5.  Turn the rotary dial to [F-3] mode.

6.  Press the **START** button to enter [F-3] mode. The ACTUAL display will show [CAL]








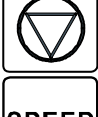
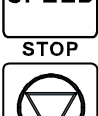
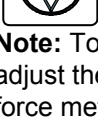
7.  Press the **STOP** button to begin the annual calibration, the REST display will show the first calibration point, **5kg (11.0 lbs)**.

## 7.2 Test & Record the Values

1.  Press the **SET** button and use the rotary dial to select the point to be calibrated.  
**Note:** Please use **Appendix Annual Calibration Table** for recording and saving.






- 2  Press the **START** button. The PULL LED will light. The traction system will PULL to calibration point value. Record the PULL value from the force meter on the **Appendix Annual Calibration Table**.
- 3  Press the **START** button again. The RELEASE LED will light. The traction system will RELEASE to calibration point value. Record the RELEASE value from the force meter on the **Appendix Annual Calibration Table**.
- 4  Press the **STOP** button. The measurement for the calibration point is complete.
- 5  If the PULL and RELEASE calibration points are within tolerance (see Test Range Spec. on Annual Calibration Table) and you wish to calibrate another point, press the **SPEED** button, and go back to step one of this section. Otherwise, go to the next section (7.3) to adjust.
- 6  If you are done with the Annual Calibration, press the **STOP** button, again, to release tension on the cable.

## 7.3 Adjust & Save the Calibration

- 1  Press the **HOLD** button. The HOLD LED will light.
- 2  Use the rotary dial to adjust HOLD/PULL value to the recorded PULL value on the **Appendix Annual Calibration Table**. If the values already match, please go to next step.
- 3  Press **REST** button. The REST LED will light.
- 4  Use the rotary dial to adjust REST value to the recorded RELEASE value on the **Appendix Annual Calibration Table**. If the values already match, please go to next step.
- 5  Press **SET** button to save. This point is calibrated.
- 6  Press **START** button to check the real PULL force. If the real PULL force on the force meter does not match the HOLD/PULL value within tolerance, please repeat annual calibration from step one of this section, until acceptable.
- 7  Press **START** button to check the real RELEASE force. If the real RELEASE force on the force meter does not match the REST value within tolerance, please repeat annual calibration from step one of this section, until acceptable.
- 8  Press **STOP** button to complete saving.
- 9  If the PULL and RELEASE calibration points are within tolerance (see Test Range Spec. on Annual Calibration Table) and you wish to calibrate another point, press the **SPEED** button, and go back to step one of section 7.2.1.
- 10  If you are done with the Annual Calibration, press the **STOP** button, again, to release tension on the cable.

**Note:** To adjust the value in kg, the REST value can match the value on force meter. However, to adjust the value in lb, the REST value may experience increased tolerance error depending on force meter sensitivity.

## 7.4 Calibrate the Next Point

- 1  Press  button to go back the main calibration menu.
- 2  Use the rotary dial to adjust the next calibration point. Follow 7.1 to 7.3 until all calibration points in **Appendix Annual Calibration Table** have been completed.
- 3  Press  button at anytime to return to the main calibration menu.  
**Note:** Incomplete calibration procedures may not be saved.

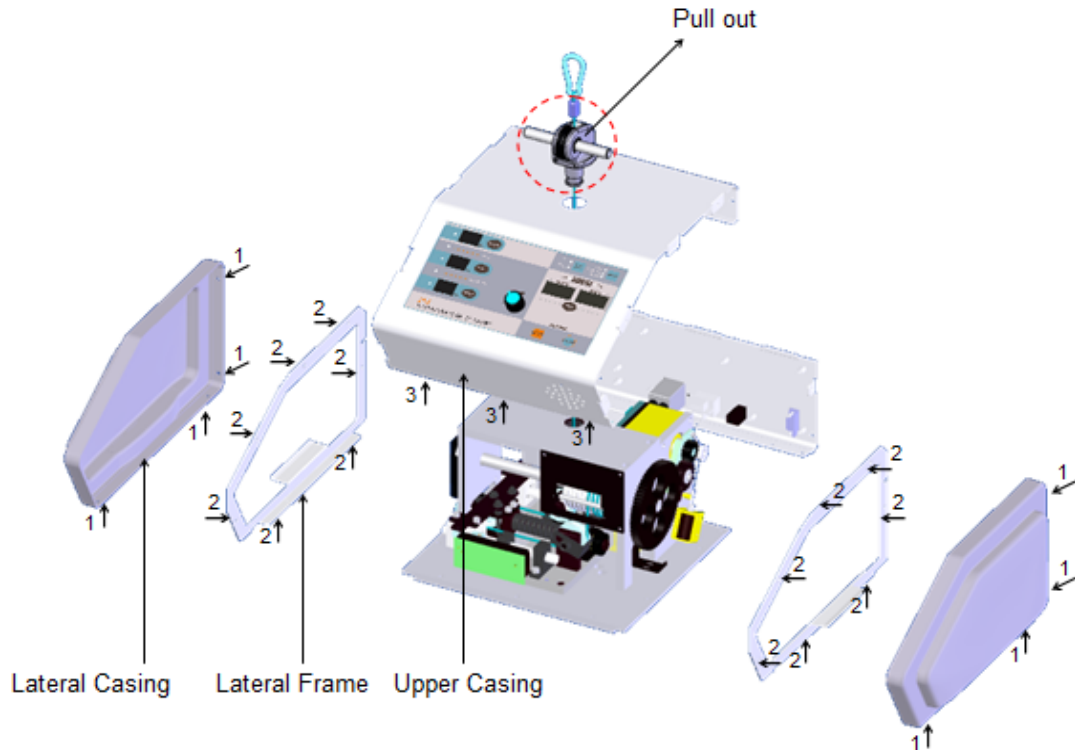




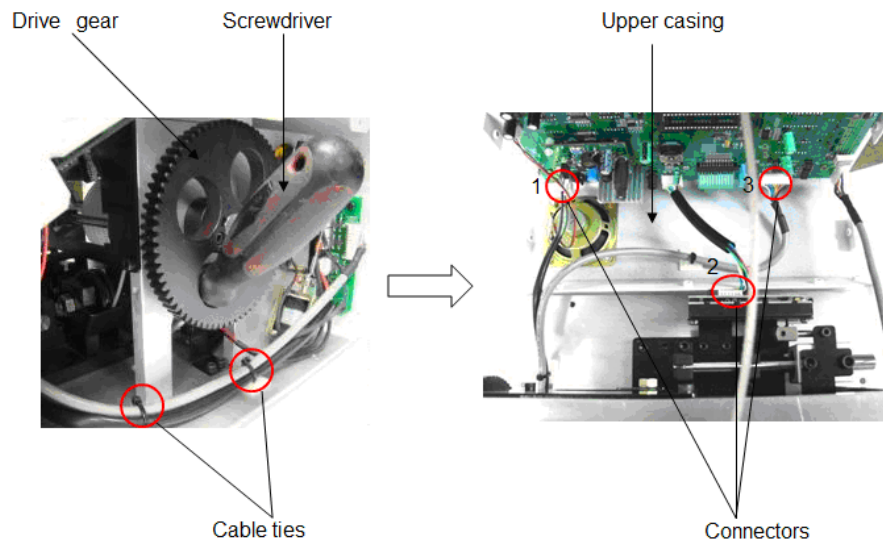
# Section 8—Traction Cable Replacement

## 8.1 Traction Cable Disassembly

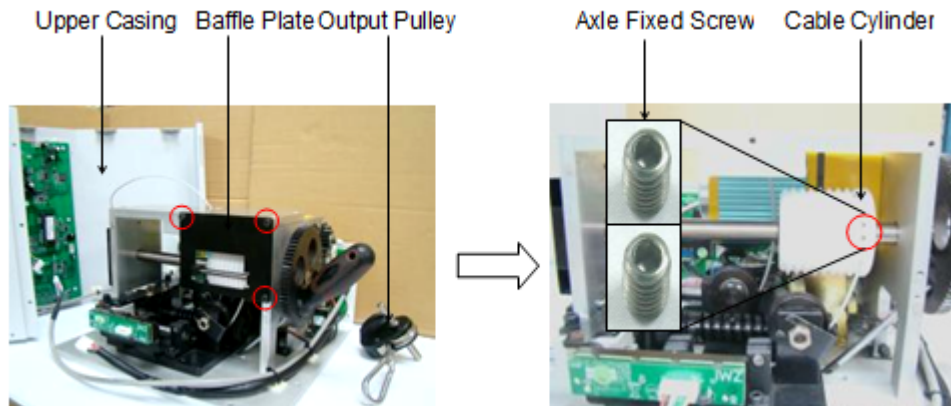
- a. Check the condition of traction cable by touching and visually inspecting. If necessary, please replace the traction cable (ME 40002).
- b. Remove screws from the two lateral casings, the lateral frames, and the upper casing at locations 1, 2 and 3 (shown below). Turn the Output Pulley wheel to face the right side of the unit. Then, fully extend the cable by removing the output pulley from the Upper Casing.



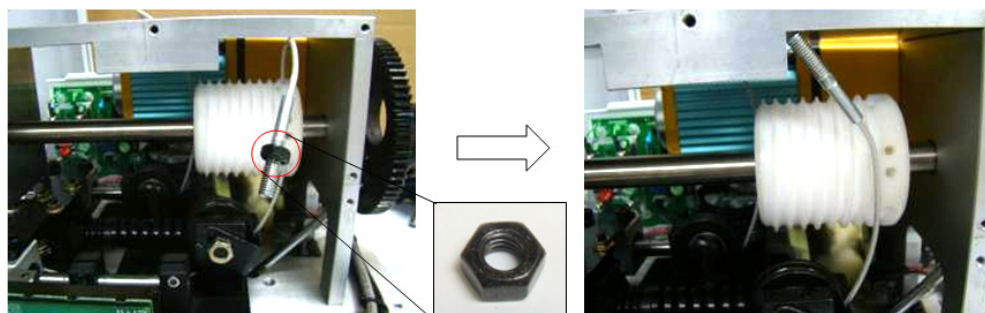
- c. After fully extending the cable, insert a screwdriver through a hole in the drive gear to fix it in place. Open the upper casing. Remove the cable ties securing the electrical cables. Then, disconnect the three connectors from locations 1, 2 and 3, as indicated below.



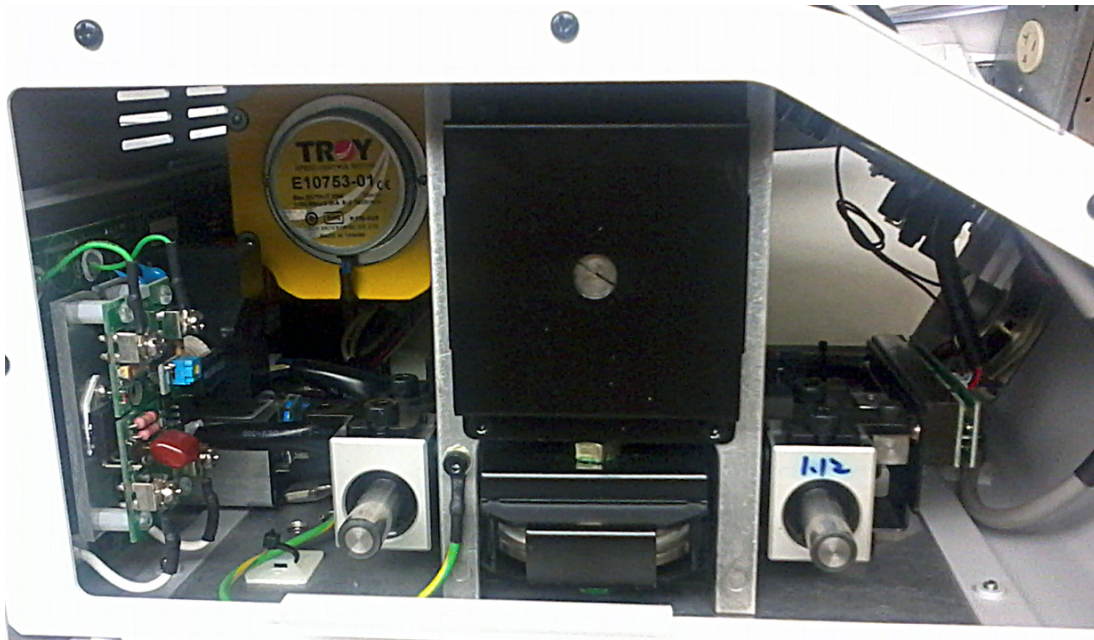
d. Lay aside the Upper Casing and Output Pulley. Unscrew and remove the Baffle Plate. Use a 2mm hex (Allen) key to remove the Axle Fixed (Set) Screws from the cable cylinder.



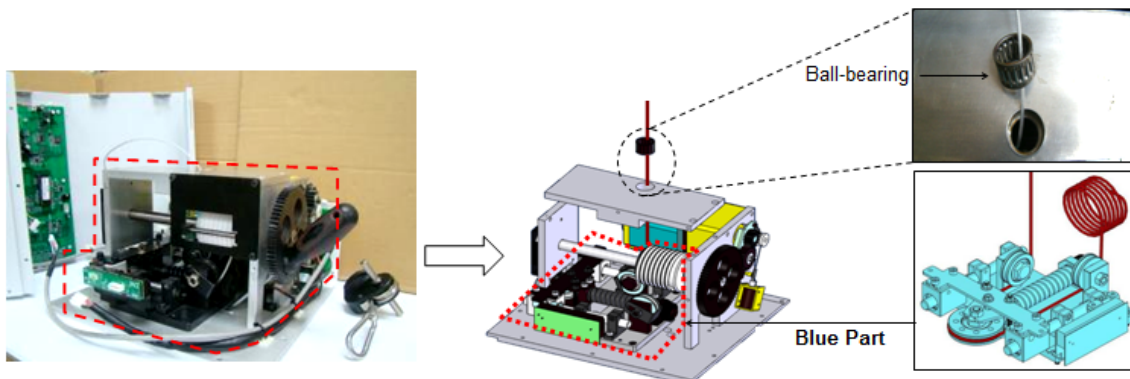
e. Remove the nut from the end of the Traction Cable where it is installed in the Cable Cylinder. Remove the cable from the cylinder.



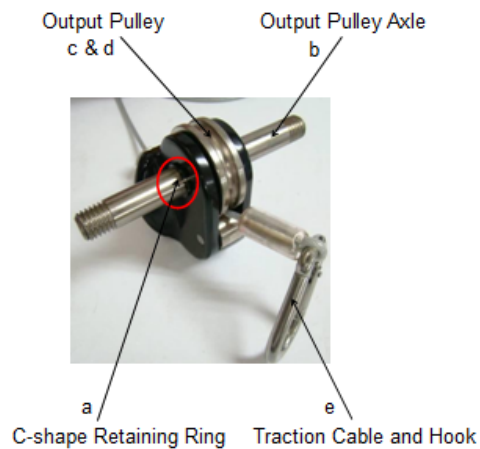
f. Unscrew and loosen the three main Cable Retaining Plates (see below), using a 3mm Hex (Allen) Key.



g. Remove the Traction Cable from the assembly shown in blue (the lower-right diagram).



h. The detachment sequence of the Traction Cable from the pulley is as follows:  
 Step (1): Detach one C-shape Retaining Ring (a) from Output Pulley Axle (b) and remove the Output Pulley Axle (b) from Output Pulley and hub (c & d).  
 Step (2): Remove the Output Pulley (c) from the hub (d) and remove the old Traction cable (e).  
 After removing, please confirm all items are located, and nothing is missing.



#### Items Confirmation

##### Step (1)



##### Step (2)

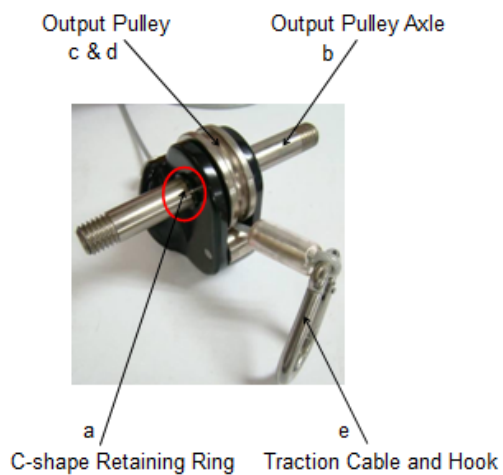


## 8.2 Traction Cable Installation

a. Before re-assembly, please confirm all items are located, and nothing is missing.

Step (1): Place a new Traction Cable (e) in the Output Pulley (c & d), as shown.

Step (2): Insert the Output Pulley Axle through Output Pulley and hub. Install a C-shape Retaining Ring to secure the Output Pulley Axle.



#### Items Confirmation

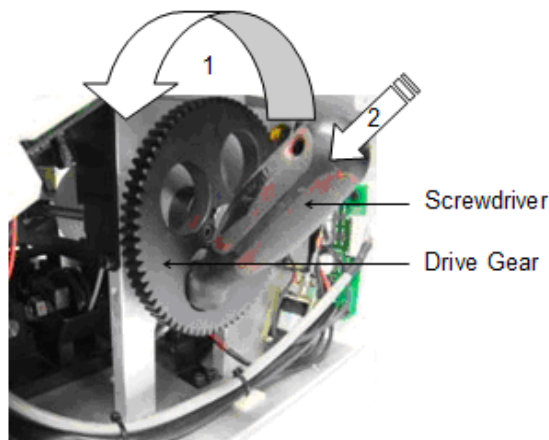
##### Step (1)



##### Step (2)

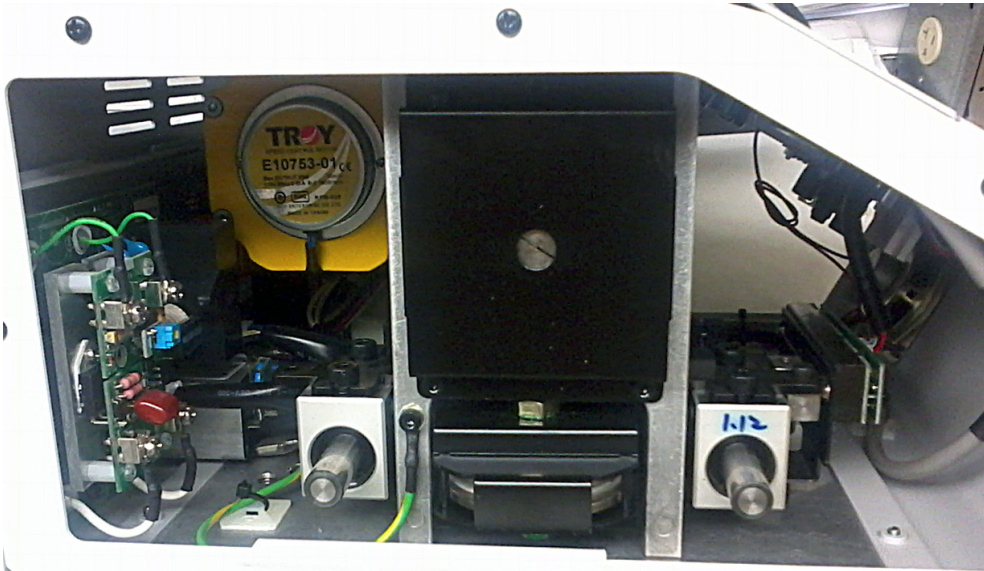


b. Note: In case the drive gear is loose, without any torque, the internal spring needs to be rewound. Please turn the Drive Gear counter-clockwise about 11 revolutions, as shown by arrow 1. Use a Screwdriver to fix the Drive Gear as indicated by arrow 2.



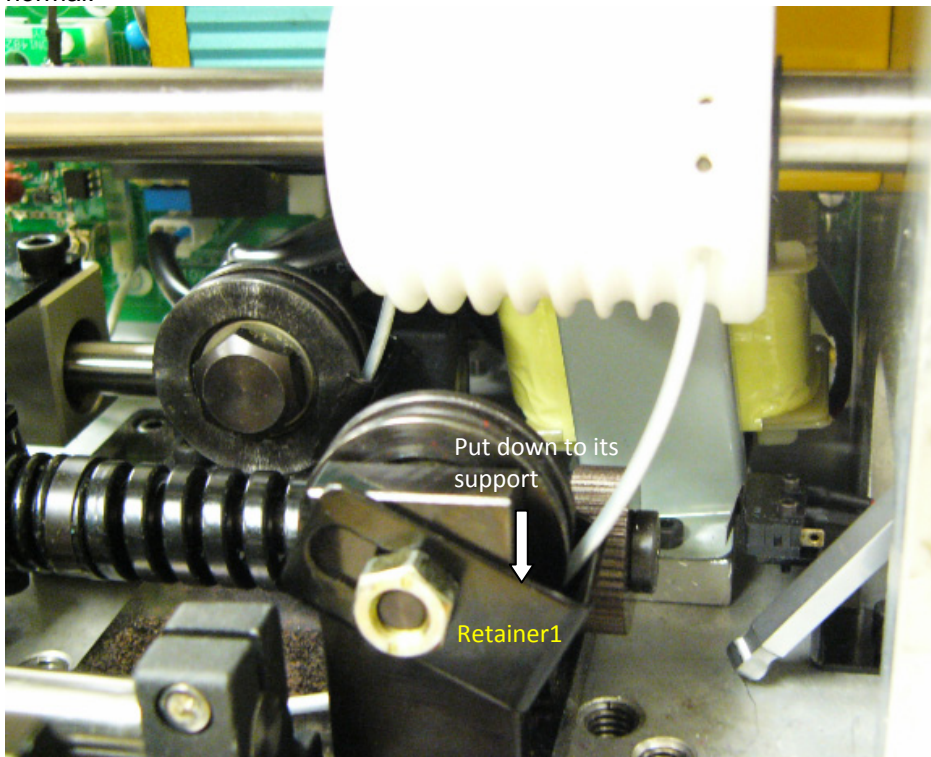


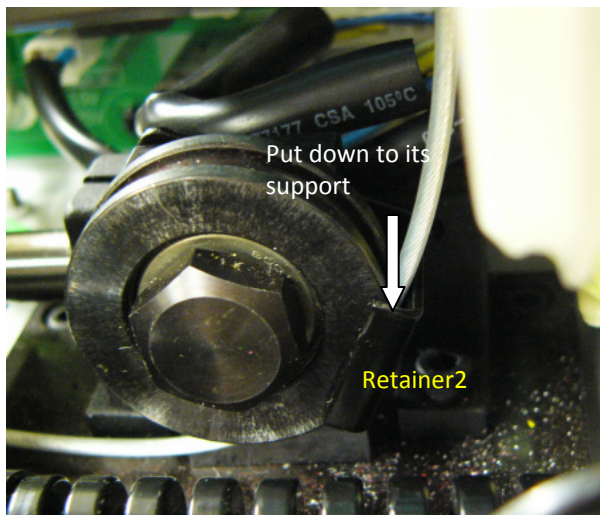
- c. Pass the Traction Cable through the Ball-bearing and the Upper Casing and into the blue part (see lower-right diagram). Wind it around as shown, following the direction through the three main Pulleys and up to the Cable Cylinder.



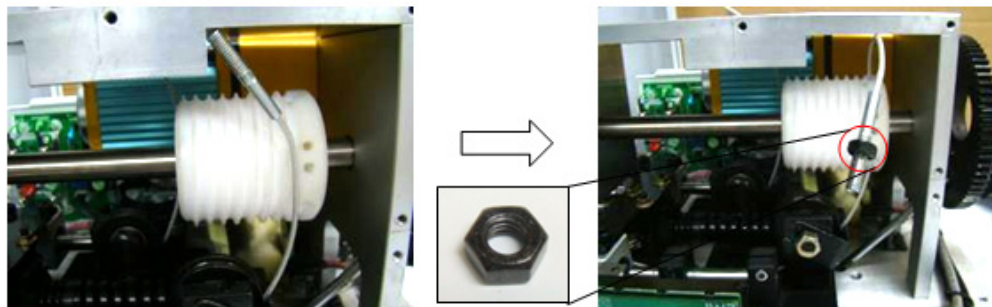
- d. Adjust the two smaller pulley retainers by rotating them against their respective vertical mounting blocks and the cable. The bow of the new cable will resist the retainer from being pushed against the pulley wheel due to its initial rigidity and, thus, provides the proper location for the retainers. Please make sure the cable is properly in the groove of pulleys. Use a 13mm open-end wrench to tighten the pulley retainer nuts. On the large horizontal pulley, install a new U-Shaped bracket per section 3 of these Modification Instructions.

Note: There is a minor interference during pulley rotation caused by the cable friction. This is normal.



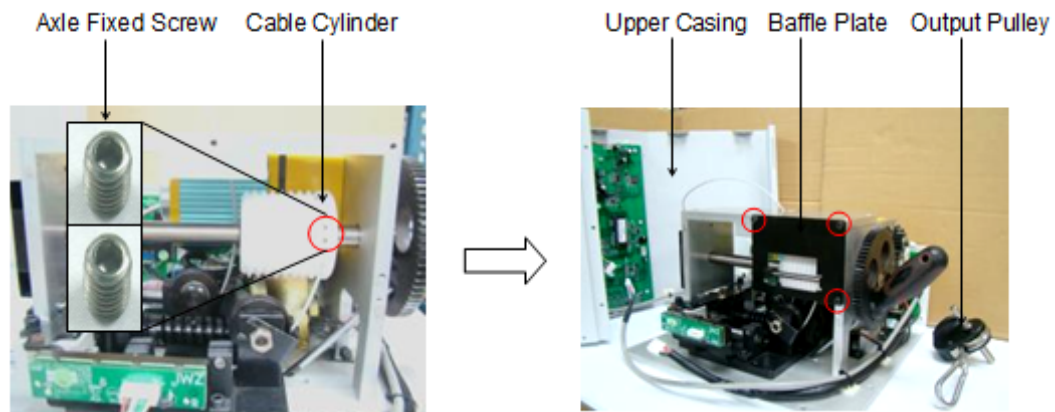


- e. Pass the end of Traction Cable through the Cable Cylinder, install the nut and firmly tighten it.

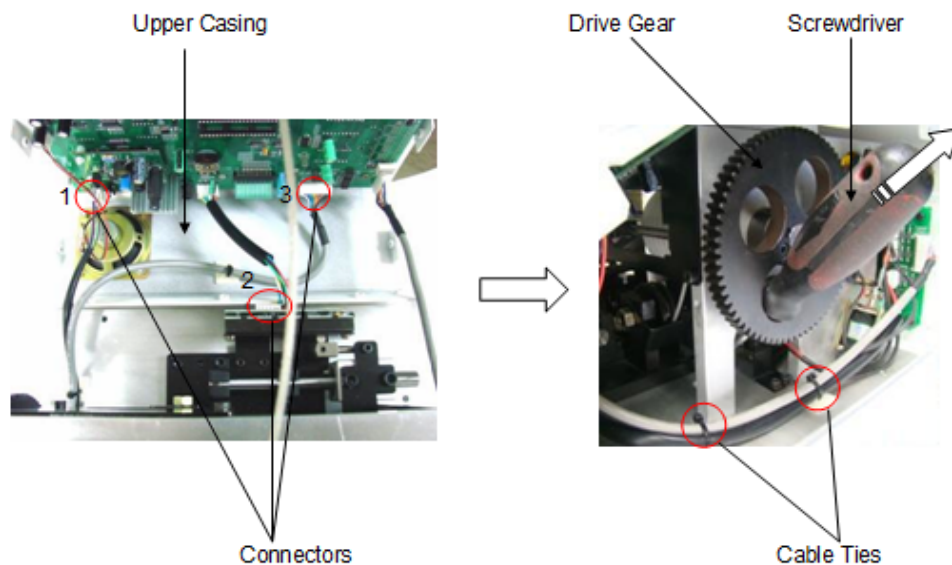


- f. Pull the end of Traction Cable completely back into the Cable Cylinder. Firmly screw the two Axle Fixed (Set) Screws, using a 2mm hex (Allen) key. Replace and screw the Baffle Plate onto the Mechanical Structure.

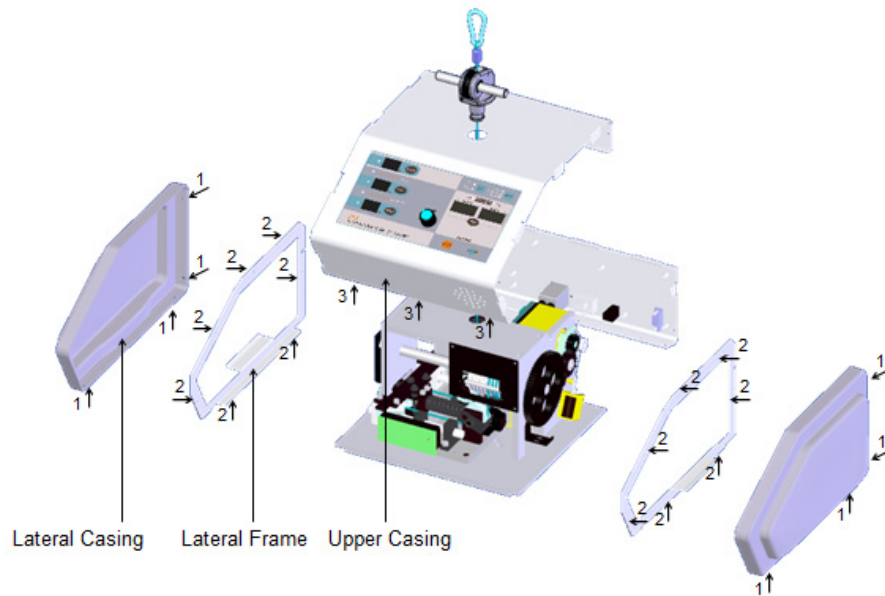




- g. Put the Upper Casing back in place and connect the three Connectors shown (1, 2 and 3) and re-fasten the two cables with Cable Ties. Then, grab the Traction Hook, remove the Screwdriver from Drive Gear, and let the Cable Cylinder slowly draw the Traction Cable back onto the cylinder track.



- h. Reinstalling the Upper Casing  
 → Install all screws from arrow 3 to arrow 1.  
 See Section 7 for recalibration.



|              |  |
|--------------|--|
| Part Number: | Traction Cable (OCP0150X) x 1<br>C-shape Retaining Ring x 2 (if necessary)                     |
| Tools:       | No.2 Hexagon Wrench<br>Philips and Flat Head Screwdriver<br>Hexagon wrench 13 mm<br>90° Pliers |



# Section 9—Factory Mode and Repair Procedure

## 9.1 Factory Mode Setting

### Factory Mode F-0 - UNIT ADJUSTMENT

This mode provides user to exchange the system unit from either metric or imperial types.

1. Press and hold [SET] button, and restart the system. The system will enter into the F-0 mode. Press [START] and press [SET] to switch the unit lb/kg. Press [STOP] to save the setting and restart again.
2. Switch the unit of force meter
  - a. Press [MODE] button to select the function UNIT by pressing [PRINT] button.
  - b. Press [MEMO] button to enter into the setting mode. Set the UNIT to LB by pressing [PRINT] button and press [MODE] to confirm.

### Factory Mode F-1 - MIDI Selection

1. Press and hold [SET] button, and restart the system. Turn the rotary dial to F-1 mode.
2. Press [START] button to confirm and then turn the rotary dial to choose MIDI music.
3. Press [START] button again to save the setting.
4. Press [STOP] button to leave the status.

### Factory Mode F-2 - MIDI Volume Level

1. Press and hold [SET] button, and restart the system. Turn the rotary dial to F-2 mode.
2. Press [START] button to confirm and then turn the rotary dial to adjust MIDI volume.
3. Press [START] button again to save the setting.
4. Press [STOP] button to leave the status.

### Factory Mode F-3 - Manual Calibration

This function is to calibrate the unit manually. Please refer to the Section 7 for its procedure.

### Factory Mode F-4 - Force Limit Setting (Hardware Protection)

This function is to help technician to set the position of limit switch for hardware protection at limit force. Please follow the procedure.

1. Set the device on the fixture and connect the RS-232 transmission cable with force meter.
2. Turn on the force meter and press the **ZERO** button.  
\*NO NEED TO PRESS **PEAK/TRACK** BUTTON ANYMORE
3. Connect the traction cable to the hook of force meter.
4. Press and hold **SET** button and turn on the system.
5. Turn the dial to [F-4] mode and press **START** button. The system will display "LSF" (Limit Switch Function) and touch the limit switch and start beeping.
6. Please press the **SPEED** button. System will return to about 88kg and pull again until touching the limit switch. Check the value on the force meter. The range (X) must be between  $94 < X < 97\text{kg}$ . If the force limit is in range and the displays of HOLD and REST show the value between 1 to 4094 (corresponding A/D value), press the **SET** button to save the limit value. The system will release the force automatically. Rotate the rotary dial to **F-6** and press **START** button to check the saving value in kg is within the range. Restart the system and run the automatic calibration procedure. If the force limit is out of the range, press and hold the **STOP** button to release the force and adjust the placement of limit switch through the following procedure:
  - a) On the Limit Switch assembly, clean the threadlocker adhesive from the heads of the screws holding the bracket in place. Loosen the two screws, using a 2mm hex (Allen) key and move the switch and its mounting bracket back towards the edge of the plate.
  - b) Run the [F-4] mode again.
  - c) Push the limit switch forward to lightly touch the mechanical drive until the system beeps. It is in

the right position for limit switch. Tighten the screw the two screws of limit switch. Press **STOP** button.

- d) Please repeat step 5 to step 6 until the force limit is right set. If the force limit is in range, please run the auto-calibration directly.
7. Put some threadlocker adhesive on the screws where the screw heads meet the bracket. The operation is complete.

#### **Factory Mode F-5 - Automatic Calibration**

This function is to provide an automatic calibration for the device maintenance and annual calibration. The calibrated data is according to the measurement of designate force meter. The sequences of automatic calibration are from minimum to maximum force and then from maximum to minimum force. Please refer to section 5.1 for the procedure.

**Note: Please refer to the procedure of AUTOMATIC CALIBRATION in the Service DVD for more detail.**

#### **Factory Mode F-6 - Read the A/D value of Load cell at Limit Force (Software Protection)**

After each automatic calibration, system will automatically record the A/D value of load cell at the limit force. This function is read only for factory test. The system will activate this software protection based on the recording A/D value when the system output exceeds the limit force.

#### **Factory Mode F-7 - Reset to Default Setting**

For each parts repair, technician shall run the F-7 mode to reset the system to the default setting. Please follow the procedure.

1. Press and hold [SET] button, and restart the system. Press both [OUTPUT MODE] and [SPEED] buttons and rotate the rotary dial to the F-7 mode.
2. Press [START] button and then press [SPEED] button. The system will display E-9 error message and recall the default setting at the same time.
3. Restart the system. (Do not press [SET] button)
4. Please confirm the initial setting is correct. The monitor will show below:

**Timer:** 15 min   **OUTPUT MODE:** intermittent   **SPEED:** Normal

**HOLD:** 5 sec   **HOLD:** 10 kg

**REST:** 5 sec   **REST:** 5 kg

**ACTUAL:** 0 kg

#### **Factory Mode F-8 - TRACTION SPEED CONTROL**

1. Press and hold [SET] button, and restart the system. Press both [OUTPUT MODE] and [SPEED] buttons and rotate the rotary dial to the F-8 mode. Press [START] button to enter into the traction speed mode.
2. Press [SPEED] button, set the speed to Fast/Normal/Slow. Press [START] button. The system will automatically run the test (arise the traction force up to 90 kg±1kg).
3. Please confirm the time is less than the setting value 10/20/30 seconds.

| Speed  | Time        | Testing Force |
|--------|-------------|---------------|
| Fast   | <10 seconds | 90 kg±1kg     |
| Normal | <20 seconds | 90 kg±1kg     |
| Slow   | <30 seconds | 90 kg±1kg     |

**Note: Please refer to the procedure of MOTOR CONTROL BOARD in the Service DVD.**

#### **Factory Mode F-9 - Traction Force Test**

1. Confirm the unit of force meter
  - a. Press [MODE] button and select the Unit function by pressing [PRINT]
  - b. Press [MEMO] button and set the unit to KG by pressing [PRINT] and press [MODE] button to confirm.
  - c. Remove the traction cable from the hook of force meter and press [ZERO] to zero the value. Please confirm the LCD shows 0.00 KG

2. Prepare the **Traction Force Test Report** ([RW09021603A](#)) for recording the traction force.
3. Press and hold [SET] button, and restart the system. Press both [OUTPUT MODE] and [SPEED] buttons and rotate the rotary dial to the F-9 mode. Hang on the traction cable on the hook of force meter. Record the initial tension (between 0.6-1.25 kg). Press [START] to run the force test mode and record the validated values of each segment on the test report.
4. When finish, the ACTUAL display will show End and system will beep.
5. Restart again (Do not press [SET] button)
6. Please confirm all initial settings are correct.

#### **Factory Mode F-A - Burn-in Test**

Each device is recommended to run the Burn Test after any repair. The system will automatically output the traction force from low to high for several times. Once the system causes any error, the test will be interrupted. Technicians or Engineers shall eliminate the error first and then restart the Burn Test until the test is complete.

Please follow the procedure:

1. Press and hold [SET] button, and restart the system. Press both [OUTPUT MODE] and [SPEED] buttons and rotate the rotary dial to the F-A mode.
2. Press [START] button to start the Burn Test. Each test will take 46 minutes. Once the test finishes, the system will return to the default status.
3. Turn off the system and wait for 2 seconds. Restart again and check the system is normal or not.

#### **Factory Mode F-b – Final force test for metric system**

After each repair or maintenance, the device shall run the FQC procedure either using the designate criteria or factory criteria. This function F-b is one of the tests in the procedure of factory FQC. In the form ([RW09021602](#)), when using F-b, system will automatically run the setting force in metric system.

**Note: Except the factory modes F1, F2, F6, F7, the other factory modes need to run together with the fixture and designate force meter.**

## 9.2 Repair procedure with factory modes:

### **Procedure1**

Replacement:

- PCBs (A/D Board/Main Board)

Procedure:

[F-5] (auto-calibration) → [F-9] (Force Test) → [F-3] (if necessary) → Mettler's QC → [F-7] (Rest the setting) → END

### **Procedure2**

Replacement:

- Parts (Micro Switch/Fuse/Transformer/Solenoid Valve/Speaker)

- Cables (A/D cable/Signal Cables)

Procedure:

Mettler's QC → [F-7] (Rest the setting) → END

### **Procedure3**

Replacement:

- PCBs (Motor Control Board)

Procedure:

[F-8] (traction speed test) → adjust the VR on the SSR (if necessary) → double check [F-8] (traction speed test) → Mettler's QC → [F-7] (Rest the setting) → END

### **Procedure4**

Replacement:

-Parts (Limit Switch)

Procedure:

F-4 (limit force check) → F-6 (Read A/D value) → END

#### **Procedure5**

Software upgrade

Procedure:

After installing the new firmware → **Procedure 4** → F-5 (auto-calibration) → F-9 (Force Test) → F-3 (if necessary) → Mettler's QC → F-7 (Rest the setting) → END

#### **Procedure6**

Replacement:

-Parts (Traction Cable)

Procedure:

F-5 (auto-calibration) → F-9 (Force Test) → F-3 (if necessary) → F-A (Burn-in) → Mettler's QC → F-7 (Rest the setting) → END

#### **Procedure7**

Replacement:

-Parts (Clutch Module/Drive Gear)

Procedure:

F-9 (Force Test) → F-3 (if necessary) → F-A (Burn-in) → Mettler's QC → F-7 (Rest the setting) → END

#### **Procedre8**

Replacement:

-Parts (Motor)

Procedure:

F-8 (traction speed test) → adjust the VR on the SSR (if necessary) → double check F-8 (traction speed test) → F-A (Burn-in) → Mettler's QC → F-7 (Rest the setting) → END

# Appendix

## Annual Calibration Table

| Worksheet Nr: _____  |       |                                     |         |                                    |         |                                     | Date : ____/____/____  |      |                                     |         |                                    |         |                          |
|--|-------|-------------------------------------|---------|------------------------------------|---------|-------------------------------------|--|------|-------------------------------------|---------|------------------------------------|---------|--------------------------|
| Device S/N : _____   |       |                                     |         |                                    |         |                                     | Unit Setting : <input type="checkbox"/> kg <input type="checkbox"/> lb |      |                                     |         |                                    |         |                          |
| Software Version : _____   |       |                                     |         |                                    |         |                                     |  |      |                                     |         |                                    |         |                          |
| ※Original Tension : _____ kg; Origin Tension Range Check 0.6 ~ 1.25 kg   |       |                                     |         |                                    |         |                                     |  |      |                                     |         |                                    |         |                          |
| ※Original Tension : _____ lbs; Origin Tension Range Check 1.3 ~ 2.76 lbs |       |                                     |         |                                    |         |                                     |  |      |                                     |         |                                    |         |                          |
| Unit   | Unit  | Record the value before calibration |         | Record the value after calibration |         | Check                               | Unit   | Unit | Record the value before calibration |         | Record the value after calibration |         | Check                    |
| kg   | lb    | Pull                                | Release | Pull                               | Release | Save                                | kg   | lb   | Pull                                | Release | Pull                               | Release | Save                     |
| 5  | 11.0  |                                     |         |                                    |         | <input type="checkbox"/>            | 50   | 110  |                                     |         |                                    |         | <input type="checkbox"/> |
| 8  | 17.6  |                                     |         |                                    |         | <input type="checkbox"/>            | 53   | 116  |                                     |         |                                    |         | <input type="checkbox"/> |
| 11   | 24.2  |                                     |         |                                    |         | <input type="checkbox"/>            | 56   | 123  |                                     |         |                                    |         | <input type="checkbox"/> |
| 14   | 30.8  |                                     |         |                                    |         | <input type="checkbox"/>            | 59   | 129  |                                     |         |                                    |         | <input type="checkbox"/> |
| 17   | 37.4  |                                     |         |                                    |         | <input type="checkbox"/>            | 62   | 136  |                                     |         |                                    |         | <input type="checkbox"/> |
| 20   | 44.0  |                                     |         |                                    |         | <input type="checkbox"/>            | 65   | 143  |                                     |         |                                    |         | <input type="checkbox"/> |
| 23   | 50.6  |                                     |         |                                    |         | <input type="checkbox"/>            | 68   | 149  |                                     |         |                                    |         | <input type="checkbox"/> |
| 26   | 57.2  |                                     |         |                                    |         | <input type="checkbox"/>            | 71   | 156  |                                     |         |                                    |         | <input type="checkbox"/> |
| 29   | 63.8  |                                     |         |                                    |         | <input type="checkbox"/>            | 74   | 162  |                                     |         |                                    |         | <input type="checkbox"/> |
| 32   | 70.4  |                                     |         |                                    |         | <input type="checkbox"/>            | 77   | 169  |                                     |         |                                    |         | <input type="checkbox"/> |
| 35   | 77.0  |                                     |         |                                    |         | <input type="checkbox"/>            | 80   | 176  |                                     |         |                                    |         | <input type="checkbox"/> |
| 38   | 83.6  |                                     |         |                                    |         | <input type="checkbox"/>            | 83   | 182  |                                     |         |                                    |         | <input type="checkbox"/> |
| 41   | 90.2  |                                     |         |                                    |         | <input type="checkbox"/>            | 86   | 189  |                                     |         |                                    |         | <input type="checkbox"/> |
| 44   | 96.8  |                                     |         |                                    |         | <input type="checkbox"/>            | 89   | 195  |                                     |         |                                    |         | <input type="checkbox"/> |
| 47   | 103.4 |                                     |         |                                    |         | <input type="checkbox"/>            |  |      |                                     |         |                                    |         | <input type="checkbox"/> |
|  |       |                                     |         |                                    |         | <input type="checkbox"/>            |  |      |                                     |         |                                    |         | <input type="checkbox"/> |
|  |       |                                     |         |                                    |         | <input type="checkbox"/>            |  |      |                                     |         |                                    |         | <input type="checkbox"/> |
|  |       |                                     |         |                                    |         | <input type="checkbox"/>            |  |      |                                     |         |                                    |         | <input type="checkbox"/> |
| Example  |       |                                     |         |                                    |         |                                     |  |      |                                     |         |                                    |         | <input type="checkbox"/> |
| 20   | 44.0  | 20.8                                | 19.3    | 20.1                               | 19.9    | <input checked="" type="checkbox"/> |  |      |                                     |         |                                    |         | <input type="checkbox"/> |

※Test Range and Specification for Metric System:

(1) 0 ~ 20Kg ± 0.75kg, (2) 21 ~ 50kg ± 1.5kg, (3) 51 ~ 90kg ± 2kg

※Test Range and Specification for Imperial System:

(1) 0 ~ 44Lb ± 2lb, (2) 46 ~ 110lb ± 3lb, (3) 112 ~ 198lb ± 4lb

Supervisor : \_\_\_\_\_ Inspector : \_\_\_\_\_

## F-9 Force Test

Main Board S/N :

Device S/N :

Date : \_\_/\_\_/

Voltage : ☐ 110V  
☐ 220V☐ Vibration Test Before (n/a)☐ Vibration Test After (n/a)

※Origin Traction : \_\_\_\_ Kg; (Initial traction force hooking on the force meter before start)

Origin Traction Check 0.6 ~ 1.25Kg (The initial traction force must locate in range of 0.6 ~ 1.25 kg)

※Test Range and Specification for Metric System: (Metric Tolerance)

(1)0 ~ 20 Kg ± 0.75 Kg、(2)21 ~ 50 Kg ± 1.5 Kg、(3)51 ~ 90 Kg ± 2 Kg

| Metric (kg)<br>Setting | Test (kg)<br>Recording | Metric (kg)<br>System | Test(kg)<br>Recording | Metric (kg)<br>System | Test(kg)<br>Recording | Metric (kg)<br>Setting | Test(kg)<br>Recording |
|------------------------|------------------------|-----------------------|-----------------------|-----------------------|-----------------------|------------------------|-----------------------|
| 2                      |                        | 5                     |                       | 26                    |                       | 60                     |                       |
| 11                     |                        | 14                    |                       | 35                    |                       | 30                     |                       |
| 20                     |                        | 23                    |                       | 44                    |                       | 13                     |                       |
| 29                     |                        | 32                    |                       | 53                    |                       | 3                      |                       |
| 38                     |                        | 41                    |                       | 62                    |                       | 6                      |                       |
| 47                     |                        | 50                    |                       | 71                    |                       | 16                     |                       |
| 56                     |                        | 59                    |                       | 80                    |                       | 40                     |                       |
| 65                     |                        | 68                    |                       | 89                    |                       | 75                     |                       |
| 74                     |                        | 77                    |                       | 80                    |                       | 40                     |                       |
| 83                     |                        | 86                    |                       | 71                    |                       | 16                     |                       |
| 90                     |                        | 77                    |                       | 62                    |                       | 6                      |                       |
| 83                     |                        | 68                    |                       | 53                    |                       | 9                      |                       |
| 74                     |                        | 59                    |                       | 44                    |                       | 19                     |                       |
| 65                     |                        | 50                    |                       | 35                    |                       | 36                     |                       |
| 56                     |                        | 41                    |                       | 26                    |                       | 55                     |                       |
| 47                     |                        | 32                    |                       | 17                    |                       | *89                    |                       |
| 38                     |                        | 23                    |                       | 8                     |                       | 55                     |                       |
| 29                     |                        | 14                    |                       | 13                    |                       | 36                     |                       |
| 20                     |                        | 5                     |                       | 30                    |                       | 19                     |                       |
| 11                     |                        | 8                     |                       | 60                    |                       | 9                      |                       |
| 2                      |                        | 17                    |                       | *86                   |                       | 24                     |                       |

Supervisor : \_\_\_\_\_ Inspector: \_\_\_\_\_

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**Note:** The numbers with grey area are for the test of non-calibration points

# Quality Acceptance Checklist

Main Board S/N :

Device S/N :

Date : \_\_/\_\_/

Voltage : ☐ 110V ; ☐ 220V

Force meter No :

| Test item  | Note                     | PASS | Fail |
|--|--------------------------|------|------|
| 1. Firmware Version Verification                           | Version: _____           |      |      |
| 2. Emergency Stop Switch Test                              |                          |      |      |
| 3. Over-Pulling Test                                       | *factory only            | n/a  | n/a  |
| 4. Pulling Speed Test                                      | *factory only            | n/a  | n/a  |
| 5. Pull Force Test - Metric System (run with F-b function) |                          |      |      |
| HOLD:5±0.75Kg , REST:2±0.75Kg                              | HOLD:___Kg. REST:___Kg   |      |      |
| HOLD:10±0.75Kg , REST:5±0.75Kg                             | HOLD:___Kg. REST:___Kg   |      |      |
| HOLD:20±0.75Kg , REST:10±0.75Kg                            | HOLD:___Kg. REST:___Kg   |      |      |
| HOLD:30±1.5Kg , REST:20±0.75Kg                             | HOLD:___Kg. REST:___Kg   |      |      |
| HOLD:40±1.5Kg , REST:30±1.5Kg                              | HOLD:___Kg. REST:___Kg   |      |      |
| HOLD:50±1.5Kg , REST:40±1.5Kg                              | HOLD:___Kg. REST:___Kg   |      |      |
| HOLD:60±2Kg , REST:50±1.5Kg                                | HOLD:___Kg. REST:___Kg   |      |      |
| HOLD:70±2Kg , REST:60±2Kg                                  | HOLD:___Kg. REST:___Kg   |      |      |
| HOLD:80±2Kg , REST:70±2Kg                                  | HOLD:___Kg. REST:___Kg   |      |      |
| HOLD:90±2Kg , REST:80±2Kg                                  | HOLD:___Kg. REST:___Kg   |      |      |
| 6.Pull Force Test - Imperial System                        |                          |      |      |
| HOLD:22±2lbs , REST:4±2lbs                                 | HOLD:___lbs. REST:___lbs |      |      |
| HOLD:110±3lbs , REST:66±3lbs                               | HOLD:___lbs. REST:___lbs |      |      |
| HOLD:198±4lbs , REST:132±4lbs                              | HOLD:___lbs. REST:___lbs |      |      |
| 7. Inspect Device Appearance and Label                     |                          |      |      |

Supervisor: \_\_\_\_\_ Inspector: \_\_\_\_\_

RW09021602

Manufactured in Taiwan by ZMI Electronics, Limited

ZMI Electronics, Limited is a participant in Good Manufacturing Practices and is qualified as an ISO 9001 and ISO 13485 supplier.

Notified Body:

Det Norske Veritas Certification AS

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Norway

